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The influences of digital marketing of energy drinks on the food-related attitudes and behaviours of young adults in Australia

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Early Start

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DEDICATION

To my daughter Ava and my upcoming baby boy Lachlan, hope you grow up in a healthier food environment.

CERTIFICATION

I, Limin Buchanan, declare that this thesis, submitted in fulfilment of the requirements for the award of the Doctor of Philosophy, in the School of Health and Society, Faculty of Social Sciences, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

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ABSTRACT

Background: The increasing global prevalence of poor quality diets is a key contributor to rising rates of obesity and non-communicable diseases and related deaths and disabilities worldwide. Dietary behaviour is exceedingly difficult to change; partly, due to the aggressive mass marketing of unhealthy products driven by food and beverage industries that influence consumers' food choices. The emergence of digital media has opened up another promotional channel for marketers to promote unhealthy food and beverages (i.e. energy-dense nutrient-poor). The unique features of digital media, such as its immersive nature and many-to-many communication, may potentially amplify the negative effects of traditional broadcast marketing (i.e. television, print media) of the unhealthy food and beverages, especially among young adults who have a strong online presence.

Aim: The research outlined in this thesis aimed to explore the influences of digital marketing on young adults' food-related attitudes and behaviours, with a special emphasis on energy drinks, a relatively new, unhealthy beverage product which contains high amounts of sugar and stimulants associated with adverse health outcomes, and are popular among young adults (aged 18-24 years) in Australia.

Methods: This research applied a mixed-methods approach that incorporated three studies. The first study used thematic content analyses to determine the nature and extent of appealing strategies used by energy drink brands on digital platforms. In this study, textual and visual elements (n= 624) were extracted from Facebook, YouTube, Twitter, websites and 'advergames' (branded online games) related to identified energy drink brands (Red Bull and V Energy) in Australia. The second study was a pre-test post-test experimental study (n= 60)

conducted to determine the impacts of digital marketing on young adults. Young adults were assigned to a short exposure of two popular energy drink brands' websites and social media pages. Pre-test post-test surveys were used to determine changes in participants' attitudes towards, and intended purchase and consumption of energy drink products. Semi-structured interviews were conducted after the experiment to determine participants' thoughts and feelings about the exposure materials in order to understand what strategies were more appealing or less appealing to the participants. The third study was an online survey (n= 359) undertaken to determine the relative strength of digital marketing as compared to other forms of marketing activities, and to determine the mediating effects of behavioural antecedents from the Theory of Planned Behaviour in the relationship between digital marketing and energy drink use.

Results: Energy drink brands appeared to target young people on digital platforms, using strategies that were likely to be attuned with young people's desires or aspirations. The thematic content analysis identified digital marketing content based on young people's desired social identity and peer connectivity. Experimental exposure to digital marketing of energy drinks enhanced young adults' interests, attitudes, intended purchase and consumption of these unhealthy products. Young adults reported to be impressed by less explicit forms of marketing techniques, such as the companies' corporate social responsibility efforts. The larger online survey identified that digital marketing was more strongly associated with young adults' energy drink consumption as compared to other forms of marketing strategies. The effects of digital marketing on energy drink consumption were mediated by the three constructs of the Theory of Planned Behaviour- attitudes, subjective norms, and perceived behavioural control.

Discussion and Conclusion: Unhealthy beverages such as energy drinks are not necessary in the diet. The widespread promotional strategies of energy drink brands on the Internet revealed in this research provide confirming evidence that energy drink industries are targeting on young people. The significant association between digital marketing and young adults' energy drink use highlighted the negative effects of digital marketing on consumption behaviours. Digital marketing strategies can be 'subtle' in appearance for instance, seeding the marketing messages through young adults' online social interactions with peers, and can generate goodwill towards companies, including through brands' online promotion of their 'philanthropic' activities. The impact of this novel form of marketing on food environment requires greater attention from the public health communities; researchers, regulators and practitioners need to be more proactive in considering regulatory and other actions to counter such marketing.

PUBLICATIONS CONSTITUTING THIS THESIS

Peer-reviewed publications (Appendices A–D)

A. Buchanan, L, Kelly, B, Yeatman, H & Kariippanon, K 2018, 'The effects of digital marketing of unhealthy commodities on young people: A systematic review', *Nutrients*, vol.10, no.148, pp. 1-19.

B. Buchanan, L, Kelly, B & Yeatman, Y 2017, 'Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation', *PLoS One*, vol.12, no.2, pp.e0171226-1-e0171226-16.

C. Buchanan, L, Yeatman, H, Kelly, B & Kariippanon, K 2018, 'Digital promotion of energy drinks to young adults is more strongly linked to consumption than other media marketing', *Journal of Nutrition Education and Behavior*, vol.50, no.9, pp.888-895.

D. Buchanan, L, Yeatman, H, Kelly, B & Kariippanon, K 2018, 'A thematic content analysis of how marketers promote unhealthy beverages on the digital platforms: energy drinks as an example', *Australian and New Zealand Journal of Public Health*, accepted on 28 August 2018. (Decision letter from the Journal)

CONFERENCES

Appendices E–I

E. Buchanan, L, Yeatman, H, Kelly, B 2014, 'Digital marketing and its influences on young people: Energy drinks as case study', Faculty of Social Sciences HDR Conference, University of Wollongong, 4 November 2014. (Oral presentation)

F. Buchanan, L, Kelly, B, Yeatman, H 2016, 'Digital marketing of unhealthy beverage- how do young adults respond?', Emerging Health Policy Research Conference in Charles Perkins Centre, University of Sydney, 13 July 2016. (Oral presentation)

G. Buchanan, L, Kelly, B, Yeatman, H 2016, 'Digital marketing of unhealthy food products- how do young adults respond?', Public Health Association of Australian (PHAA) 44th Annual and 20th Chronic Diseases Network Conference in Alice Spring, Australia, 18-21 September 2016. (Oral presentation)

H. Buchanan, L, Yeatman H, Kelly, B, Kariippanon, K 2017 'Digital marketing of unhealthy food products to young adults: energy drinks as example', 15th World Congress on Public Health 2017 in Melbourne, Australia, 3-7 April 2017. (Oral presentation)

I. Buchanan, L, Yeatman H, Kelly, B, Kariippanon, K 2018 'The effects of digital marketing of unhealthy commodities on young people: A systematic

review', Public Health Prevention Conference 2018 in Sydney, Australia, 2-3 May 2018. (Oral presentation)

MEDIA COVERAGE OF THESIS RELATED RESEARCH

Appendices J–M

J. **Newsletter:** "Energy drinks and young Australians". In Touch newsletter of the Public Health Association of Australia, May 2014.

K. **Article:** "The apple a day message got a bit more complicated". Alice Springs News

online, 19 September 2016. http://www.alicespringsnews.com.au/2016/09/19/the-apple-a-day-message-got-a-bit-more-complicated/

Interview: "How does online marketing affect young people". In the Loop, 12 June 2017. https://www.youtube.com/watch?v=L1m5g_lXYck

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L. **Article:** "University of Wollongong Study shows increase in energy drink consumption due to online advertising". Illawarra Mercury Newspaper, 22 March 2017. http://www.illawarramercury.com.au/story/4548353/online-ads-blamed-for-making-young-people-unhealthy/

M. **Media release:** "Digital marketing enhancing unhealthy choices". University of Wollongong website, 22 March 2017. https://media.uow.edu.au/releases/UOW230420

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS

Abbreviation	Full name
AANA	Australian Association of National Advertiser
ABS	Australian Bureau of Statistics
ACMA	Australian Communications and Media Authority
Apps	Applications
CASP	Critical Appraisal Skills Program
EDNP	Energy-dense nutrient-poor
ELM	Elaboration Likelihood Model
eWOM	Electronic word-of-mouth
FSANZ	Food Standard Australia New Zealand
NCDs	Non-communicable diseases
NIH	National Institute of Health
NHLBI	National Heart, Lung and Blood Institute
PBC	Perceived Behavioural Control
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses
PROSPERO	International Prospective Register of Systematic Review
QSRI	Quick Service Restaurant Initiative for Responsible Advertising and Marketing to Children
RCMI	Responsible Children's Marketing Initiative
SES	Socio-economic status
SIT	Social Identity Theory
SNS	Social networking sites

TPB	Theory of Planned Behaviour
UNICEF	United Nations Children's Fund
WHO	World Health Organization

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: GENERAL INTRODUCTION

1.1 Background and rationale of the study

1.1.1 The marketing of unhealthy food and beverages and public health

Non-communicable diseases (NCDs) are the leading cause of deaths worldwide, accounting for 40 million deaths, which equates 70% global deaths annually (World Health Organization 2017). Among the top ten causes of global death as published by the World Health Organization (WHO) in 2017, half of them were NCDs (World Health Organization 2012). NCDs include a wide range of chronic conditions, including cardiovascular diseases, chronic respiratory diseases, diabetes, and cancers (World Health Organization 2017). However, the causes responsible for these NCDs are common and one of the key drivers of NCDs is the globalisation of unhealthy lifestyles; this signifies that the risk factors associated with NCDs are modifiable and numerous deaths caused by these conditions can be prevented (World Health Organization 2015). However, dietary behaviours are exceedingly difficult to change over the long term, and so far, no country has successfully managed to alter the trajectory of the increasing prevalence of overweight and obesity among adults (Lowell 2004). One of the main challenges in this regard has been the wide environmental influence on people's dietary behaviours. In particular, aggressive mass marketing campaigns, driven by unhealthy food and beverage manufacturing industries, that impact on people's food choices (Moodie et al. 2013).

1.1.2 A shift from traditional marketing to digital marketing

There is now strong evidence to indicate that commercial marketing influences both children's and adults' attitudes towards food and beverage products, food preferences, purchases and consumption behaviours, hereby collectively referred to as "food-related

attitudes and behaviours" (Cairns et al. 2013; Hastings et al. 2003; Jenkin et al. 2014; Mills et al. 2012). Most of the available literature on the effects of marketing focused on traditional media, particularly television marketing. However, with the rapid proliferation of digital devices and online platforms, it has been recognised that promotion of food and beverage products through the digital channels add to, and may even amplify the effects of traditional marketing on people's food-related attitudes and behaviours.

Evidence suggests that the food and beverage industries have increasingly shifted their marketing budgets to encompass digital marketing (Federal Trade Commission 2012). The worldwide marketing expenditure data of the manufacturing food industry are not publicly available. However, in the USA, the expenditure on food marketing towards children through television declined by 20% while spending on digital marketing climbed by 50% from 2006 to 2009 (Federal Trade Commission 2012). These data indicate that the food manufacturing industries are making good use of the advancement of digital technologies to create more opportunities to promote their products and to reinforce their marketing messages (Wilking et al. 2013).

1.1.3 The potential effects of digital marketing

Digital marketing encompasses any promotional activities undertaken through websites, social networking sites (SNS), emails, mobile phone texts, applications (apps), and online games (Kelly et al. 2015). Several unique features of digital media make digital marketing distinctly different from traditional marketing, including the capacity for the following: (i) engagement – the participatory online environment especially through SNS allows marketing communication to evolve from one-way communication within the traditional platforms to multifaceted, interactive communication within the digital platforms where users can also

generate contents; (ii) personalisation – through the data collection capabilities of the digital devices, marketers have unprecedented access to a wealth of data about the users' demographic details, geographic locations, and previous purchase histories, thus allowing the marketers to tailor their marketing messages specifically to individuals; (iii) social relationships – the digital marketers can tap into the users' online social relationships, for instance through the 'friends' function in Facebook, and subsequently utilise online peer networks to distribute marketing messages [also known as electronic word-of-mouth (eWOM)]; (iv) ubiquitous connectivity – digital devices such as smart phones allow users to have constant connectivity to technology; and (v) immersive environments – seamless integration of marketing content on digital media captures audiences' attention for longer, as compared to the 20 to 30 seconds of television advertising (Montgomery et al. 2011; Wilking et al. 2013; Montgomery et al. 2017). All of these distinct characteristics of digital marketing may allow marketers of unhealthy food and beverages to exert more negative impacts on food-related attitudes and behaviours.

1.1.4 Young adults- A vulnerable group

Young adults who have a strong online presence and growing purchasing power are especially vulnerable to digital marketing of unhealthy food and beverages (Freeman et al. 2015; Montgomery et al. 2012). Australian Bureau of Statistics (ABS) data indicates that 98% of young adults in Australia have access to the Internet and 46% of them spend 15 hours or more per week on the Internet (Australian Bureau of Statistics 2016). Young adulthood, also known as 'emerging adulthood', is constituted by young people aged 18 to 24 years (Miller & Hickling 2006; Perez et al. 2012; Piggford et al. 2008).This age period is synonymous with transitional life stages, where many transit from high school to university or work, from living at the parental home to living independently, and from being meal

recipients to being solely responsible for meal purchase and preparation (Blatterer 2010). Young adults' inexperience in food purchase and preparation may open up opportunities for marketers of unhealthy food and beverages. In fact, this age group has been found to have poorer dietary habits (Stewart & Tinsley 1995) and to consume more unhealthy food and beverages than the other age groups (Australian Bureau of Statistics 2014a). There is also evidences to suggest that the marketers have segmented this age group, often known as "Millennials" and strategies have been developed to specifically targeting their purchasing behaviours (Sogari et al. 2017).

The health status of young adults is a public health concern. The epidemiology data of recent population cohorts suggest that this age group experiences rapid weight gain (Hayes et al. 2017), and 39% young adults in Australia are overweight or obese (Australian Bureau of Statistics 2015). Nevertheless, there is a clear lack of research on young adults' responses to food and beverage marketing, with the majority of existing literature focused on the marketing effects on children's dietary habits (Kelly et al. 2011; Hastings et al. 2003). To our knowledge, limited research has been undertaken to examine the effects of unhealthy food and beverage marketing on this age group.

1.1.5 Energy drinks as an exemplar

One of the popular non-alcoholic beverages among young adults and a useful exemplar to understand the effects of digital marketing on this age group's food-related attitudes and behaviours is energy drinks. Energy drink represents a new product category, defined as 'a non-alcoholic caffeine containing beverage typically consumed to provide an energy boost or for mental alertness' (Food Regulation Standing Committee Caffeine Working Group 2013, p.2). Energy drinks are relatively new, as compared to sweetened soda, sports drinks, juices,

coffee and tea; the introduction of energy drinks to the global market date to the debut of Red Bull in 1987 in Austria (Ali et al. 2015). These drinks, however, have quickly gained popularity. The demand for energy drinks continue to grow despite the declining global sales of soft drinks (Visram et al. 2017), and these drinks are now available in more than 140 countries and many brands have been developed since 1987 (Ali et al. 2015). The most popular brands in the Australian market include Red Bull, Mother, V Energy, Rockstar and Monster (REIZE Energy drink 2017). Some energy drink brands are not available in Australia but are popular in other countries such as in the United States which include AMP Energy and Full Throttle (Crawford et al. 2014; Ali et al. 2015).

The existence of the variety of brands indicates the competitive energy drinks market. One of the initial roles of 'brand' is to differentiate goods or services of one seller or group of sellers from their competitors (Chernatony 2009). The philanthropy of 'brand' is based on brand communities where a group of members are bound together by a structured set of social relationships which are characterised by shared interests, consciousness and a sense of moral responsibility for the group (Muñiz and O'Guinn 2001). For marketers, brand communities have the potential to enhance consumer loyalty (Hede and Kellet 2012).

There is evidence to suggest that the consumption of energy drinks is high; data from the Australian Health Survey 2011–12 indicate that adolescents and young adults are the biggest consumers of energy drinks (Australian Bureau of Statistics 2015), and data from the Australian Beverages Council show that young Australians aged 18 to 24 years had the highest level of energy drinks consumption – 21.3% (Zest Health Strategies 2011). It should be noted that in the Australian population and also in many other countries, the total energy intake per person per day associated with consuming energy drinks are low compared to other

sugary beverage sub-categories (Australian Bureau of Statistics, 2014a; Popkin & Hawkes 2016).

Energy drinks are marketed to improve alertness, concentration and stamina (Fogger & McGuinness 2011). These drinks contain caffeine and other stimulants, such as guarana and ginseng. Many also contain large amounts of sugar, although artificially sweetened varieties are available (Heckman et al. 2010). Other botanical ingredients such as ginseng and gingko biloba are also commonly found in these drinks (Crawford et al. 2014). The claimed functionality and health benefits may have fuelled their popularity, but there are no clinically proven therapeutic effects of these drinks, and many ingredients are neither well-studied nor regulated (Seifert et al. 2011). Instead, emerging evidence has shown the negative physiological and psychological effects of energy drinks and some researchers have classified energy drink use as a health issue (Ishak et al. 2012; Ali et al. 2015). The high sugar contents of these drinks are linked to dental caries and weight gain (Gibson & Neate 2007; Jain et al. 2012), while the overconsumption of caffeine and other stimulants have contributed to increased blood pressure, anxiety, and insomnia (Ali et al. 2015). A handful of case reports have also associated energy drink use with heart attacks or even death (Starling 2008; Wootson Jr 2016). Additionally, it is suggested that as part of a partying culture, energy drinks are often mixed with alcohol. This practice worsens the health implications of these drinks, since the stimulants in energy drinks may mask the intoxication effects of alcohol and lead to heavier alcohol consumption (Breda et al. 2014) .

1.1.6 Current regulations and codes

While the composition and labelling of energy drinks is regulated by the Food Standard Australia New Zealand (FSANZ) code (Food Standard Australia New Zealand 2013), the marketing of these drinks is relatively unrestricted in Australia.

Regulations on food and beverage marketing are yet to catch up to the advances in digital marketing. The existing regulatory provisions do not cover the platforms or techniques that are used to market unhealthy commodities online. The Australian Communications and Media Authority (ACMA) regulations on food marketing extend only to television and only refer to children less than 14 years (Australian Communications and Media Authority 2016). The two self-regulatory food industry codes of practice, which were developed in collaboration with the Australian Association of National Advertisers (AANA) – namely, the Responsible Children's Marketing Initiative (RCMI) and the Quick Service Restaurant Initiative for Responsible Advertising and Marketing to Children (QSRI) – are designed to protect those under the age of 12 (Australian Food & Grocery Council 2018). These codes cover company-owned and brand websites, where greater than 35% of the audience are children.

Until this time, research on the digital marketing effects on young adults' food-related attitudes and behaviours remains scarce. This thesis addresses this area, using energy drinks as an exemplar, by determining the influences of digital marketing on young adults' energy drink use. Specifically, this research provides evidence on the nature and extent of promotional strategies of energy drinks on the digital platforms, and how digital marketing exerts influences on young adults' food-related attitudes and behaviours. This research will contribute to an understanding of the use and influences of digital marketing on young adults'

food-related attitudes and behaviours. It will also provide insights for the public health community to develop effective strategies, potentially including regulations, relating to the mitigation of the negative effects of digital marketing in relation to the consumption of unhealthy food and beverage products.

1.2 Study aims

The aim of this research was to explore the influences of digital marketing on young adults' unhealthy food-related attitudes and behaviours, using energy drinks as an exemplar.

1.3 Objectives of the research

The specific objectives of this research were the following:

1. To examine the nature and extent of the promotional strategies of energy drinks on digital media platforms.
2. To investigate how digital marketing of energy drinks influence young adults' food-related behaviours.
3. To examine if digital marketing strategies are more strongly associated with energy drink use than other marketing.

1.4 Research questions

The studies reported in this thesis answer these specific questions:

1. What promotional strategies are used by energy drink marketers to target young people on digital platforms, and to what extent?
2. a) Is there an association between exposure to digital marketing and young adults' beliefs about, and attitudes towards, intended purchase and consumption of energy drinks?

b) Why do digital promotional strategies appeal to young adults?

3. a) What is the reported awareness about digital marketing of energy drinks among young adults?

   b) What is the relative strength of digital marketing as compared to other forms of marketing regarding energy drink use?

   c) What could potentially mediate the effects of digital marketing on energy drink use?

1.5 Significance of the research

Understanding young adults' food-related attitudes and behaviours is very important to improve the health status of this age group. Health behaviours at this age determine their future health status and shape the future health of the whole population. This study will provide evidence on the nature and extent of the promotional strategies that marketers utilise on digital platforms to promote unhealthy beverage products – specifically, energy drinks – to young adults. The study findings will provide insights for public health communities regarding this new form of marketing, which may potentially amplify the negative effects from the traditional marketing of the unhealthy food and beverages.

Young adults' perspectives on digital marketing of unhealthy beverage products like energy drinks have never been explored. This study will reveal how and why digital marketing exerts effects on young adults and what stimulates them to consume unhealthy products like energy drinks. This will provide an important basis to develop future health interventions to counter the effects of unhealthy digital marketing.

This research will also reveal the relative strength of digital marketing in comparison to the traditional non-digital marketing. It will illuminate the behavioural antecedents using

psychosocial theories as a basis for exploring the relationship between digital marketing and food-related attitudes and behaviours. It is anticipated that the findings of this research will inform, motivate and guide public health researchers and policy makers to develop effective strategies to reduce digital marketing of unhealthy food and beverage products.

1.6 Outline of the thesis

This research is presented as a thesis by compilation, including published articles and manuscripts submitted to, or under review by, peer-reviewed journals. Each publication or manuscript is presented in a separate chapter. The following provides a brief outline of the chapters within this thesis. Figure 1.1 shows the outline of the thesis structure. All references are presented collectively at the end of the thesis.

Chapter 2 comprises a systematic review of relevant research. As mentioned above, studies on the effects of digital marketing for food and beverages on young adults are scarce. As a result, this systematic review spans research from alcohol, tobacco, food and non-alcoholic beverage marketing fields and covers research on adolescents as well as on young adults in order to demonstrate the effects of this new form of marketing across different unhealthy commodities and age groups.

Chapter 3 provides an overview of the methodology applied in this research. It outlines the mixed-methods approach adopted to answer the research questions and the overall conceptual framework of this research. The chapter is organised into the following sections: (i) restatement of the research purpose, (ii) research approach, (iii) philosophical assumptions, (iv) research design, (v) conceptual framework, (vi) research methods including means of data collection and of data analysis, and (vii) ethical considerations.

Chapter 4 describes a thematic content analysis of the promotional strategies used by energy drink marketers across different digital platforms, including Facebook, Twitter, YouTube, websites and advergames (i.e. brands or products embedded within online games). The nature and extent of digital marketing strategies of nine popular energy drink brands were assessed. This chapter reveals the appeal strategies used by digital marketers to target young people.

Chapter 5 describes an experimental research where young adults are exposed to digital marketing of two popular energy drink brands, based on the appeal strategies identified in Chapter 4. Pre-test post-test surveys examined if the exposure changed the participants' attitudes towards, intended purchase and consumption of energy drinks. Semi-structured interviews were conducted at the end of the experiment to examine why the participants were appealed to or repelled by the exposed materials. This chapter provides insights into how digital marketing exerts influences on young adults' food-related behaviours.

Chapter 6 describes the findings from an online survey on young adults. The participants' exposure to, and engagement with, digital marketing and other forms of marketing of energy drinks, and their energy drink use status were measured. These data were used to compare if digital marketing is more strongly associated with energy drink use among young adults than other forms of marketing. The mediating effects of behavioural antecedents of a psychosocial theory in the relationship between digital marketing and energy drink use were also examined. This chapter will call for stronger government and industry regulation of unhealthy beverage promotion via all media platforms including digital media. Also revealed in this chapter are the potential mediators of the effects of digital marketing on energy drink

use. These findings would inform effective strategies for health interventions that target marketing-related influences on health behaviours of this age group.

Finally, *Chapter 7* presents an overall discussion of the major findings of the combined results derived from the three studies. This chapter firstly summarises and integrates the research findings. It then discusses the implications of this research for public health actions and potential approaches to reduce the impact of using digital marketing and media platforms to promote unhealthy beverage products. The strengths and limitations of the studies are considered, recommendations for future research are made, and the significance of the research findings is presented. The chapter concludes by discussing the implications of the findings for appropriate interventions to moderate the influences of digital marketing and provides recommendations to guide future research and interventions.

1.7 Summary of this chapter

This chapter provided an overview of the thesis, a brief background and rationale of this research. It outlined the overall aim and objectives and the research questions addressed by the included three studies. This chapter also highlights the significance of this research. The chapter ended by providing a brief description of each of the following chapters. The next chapter presents a systematic review of the existing relevant literature and demonstrates the need for the current research.

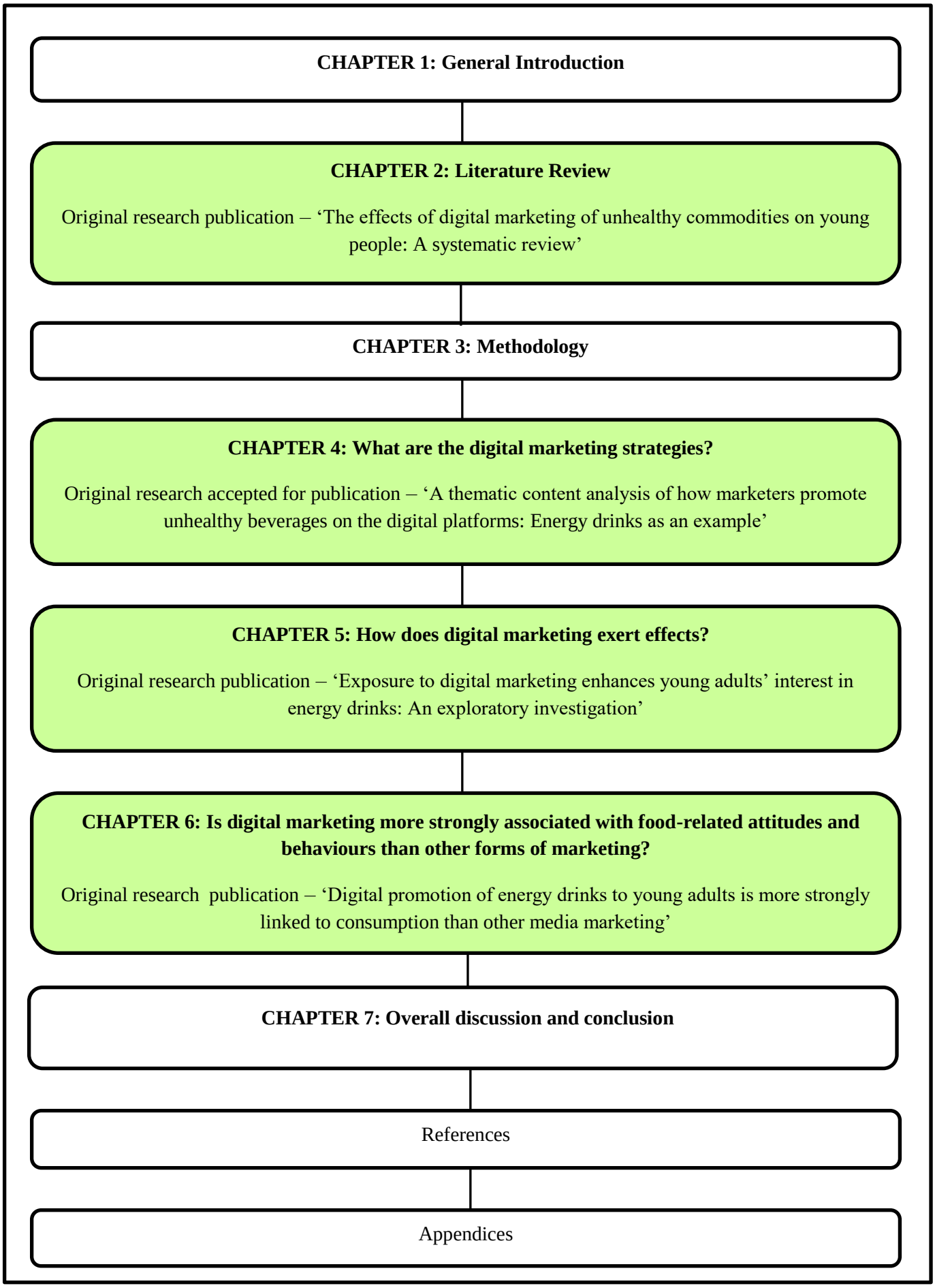

Figure 1.1: Outline of Thesis Structure

CHAPTER TWO: LITERATURE REVIEW

2.1 Preface

Modern technologies have become an increasingly powerful influence in the lives of young people. As early adopters of emergent technology, young people immerse themselves with digital technologies, and use digital media in evermore social and interactive ways (Gerwin et al. 2018). As mentioned in the background section in Chapter 1, the vast majority of research that has been undertaken to understand the influences of digital food marketing has primarily focused on young children (Cairns et al. 2013; Hastings et al. 2003; Jenkin et al. 2014). There is a clear need for research to increase understanding of the association between digital marketing and young adults' food-related attitudes and behaviours. Although the potential negative influences of digital marketing of alcohol and tobacco products have been documented in previous literature (Harper & Martin 2002; McCreanor et al. 2012), studies on the effects of digital marketing of food or non-alcoholic beverages on young adults are scant (Mills et al. 2012). Given that food and non-alcoholic companies often adopt similar marketing strategies as that of alcohol and tobacco industry (Moodie et al. 2013), this chapter presents a literature review on the effects of digital marketing of 'unhealthy commodities' [i.e. ultra-processed, energy-dense nutrient-poor (EDNP) food and non-alcoholic beverages, alcohol and tobacco] on young people, including adolescents and young adults (aged 12–30 years).

This chapter comprises two parts. The first part presents a systematic literature review published in 2018. Quantitative and qualitative studies were reviewed to examine the relationship between digital marketing and young people's attitudes and behaviours towards unhealthy commodities. The included qualitative studies provided insights into the ways in

which marketing exerted influence on this age group. The second part of this chapter presents an update of the relevant literature that became available after the systematic review was published. The relevance of this literature, its quality appraisal, and the alignment of its findings with the published systematic review are all presented.

The first part of this chapter has been written and published during the course of this degree in a peer-reviewed journal (Appendix A). It is presented as it was published, with minor modifications in formatting– i.e. the referencing style, figure and table numbers– to ensure cohesion within the thesis and to conform to the University of Wollongong's referencing style.

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Authors' contribution: L. Buchanan has responsibility for the conception of the study, study design, data collection, data analysis and interpretation, and writing the original draft of the manuscript. H. Yeatman and B. Kelly contributed to the conception of the study, analysis and interpretation of the results, and review and editing of the manuscript. K. Kariippanon contributed to the reliability check of data analysis, review and editing of the manuscript.

Key findings of this review were also presented at the Public Health Prevention Conference 2018 in Sydney, Australia, 2-3 May 2018 (Appendix G).

2.2 The published systematic review- The effects of digital marketing of unhealthy commodities on young people: A systematic review

2.2.1 Abstract

The marketing of unhealthy commodities through traditional media is known to impact consumers' product attitudes and behaviours. Less is known about the impacts of digital marketing (online promotional activities), especially among young people who have a strong online presence. This review systematically assesses the relationship between digital marketing and young people's attitudes and behaviours towards unhealthy commodities. Literature was identified in June 2017 by searches in six electronic databases. Primary studies (both qualitative and quantitative) that examined the effect of digital marketing of unhealthy food or beverages, alcohol and tobacco products on young people's (12 to 30 years) attitudes, intended and actual consumption were reviewed. 28 relevant studies were identified. Significant detrimental effects of digital marketing on the intended use and actual consumption of unhealthy commodities were revealed in the majority of the included studies. Findings from the qualitative studies were summarized and these findings provided insights on how digital marketing exerts effects on young people. One of the key findings was that marketers used peer-to-peer transmission of messages on social networking sites (e.g., friends' likes and comments on Facebook) to blur the boundary between marketing contents and online peer activities. Digital marketing of unhealthy commodities is associated with young people's use and beliefs of these products. The effects of digital marketing varied between product types and peer endorsed marketing (earned media) may exert greater negative impacts than owned or paid media marketing.

Keywords: digital marketing; online marketing; unhealthy commodities; young people; consumption behaviours; systematic review

2.2.2 Introduction

Non-communicable diseases (NCDs) are the leading causes of death and disability across many nations (World Health Organization 2015). Major modifiable risk factors for NCDs include the consumption of unhealthy commodities such as ultra-processed, energy-dense nutrient-poor (EDNP) food and beverages, tobacco and alcohol (GBD 2016 Risk Factors Collaborators 2017). Commercial marketing of these unhealthy commodities propagates their use, where this marketing is ubiquitous, repetitive and reinforced across media platforms. Evidence of the effects on behaviours of marketing various unhealthy commodities, as summarized by previous reviews, has found a remarkable degree of consistency regarding the widespread and detrimental effects of these marketing efforts (Anderson et al. 2009; Cairns et al. 2013; Gupta et al. 2016; Hastings et al. 2003; Jenkin et al. 2014; Payneter & Edwards 2009; Smith & Foxcroft 2009).

Most of the available literature that explores the effects of marketing unhealthy commodities focuses on traditional broadcast media, namely television (Cairns et al. 2013; Hastings et al. 2003; Jenkin et al. 2014). Although television remains the most utilized promotional channel, evidence suggests that its dominance is waning (Federal Trade Commission 2012). Detailed expenditure data for unhealthy commodities marketing are not publicly accessible but what is available indicates that the manufacturing food industry is shifting their marketing budgets from traditional media to digital media. In the USA, spending on children-directed television marketing has experienced a decline of 20% while spending on digital media marketing rose by 50% between 2006 and 2009 (Federal Trade Commission 2012).

Digital marketing encompasses any promotional activities undertaken through websites, social networking sites (SNS), emails, mobile phone texts, applications (apps) and online

games (Kelly et al. 2015). This form of marketing is well-regarded in the literature within marketing and advertising research fields for its ubiquity, interactivity and 24/7 availability (Spero & Stone 2004). There is a suggestion that digital marketing is even more impactful than traditional marketing due to its characteristic of peer endorsement and lack of explicit advertising cues presented in some forms of digital media (Kelly et al. 2015), for instance, 'seeding' a message on SNS and transmitting this through online communities.

The vast majority of research that has been undertaken to understand the effects of commercial marketing of unhealthy commodities has focused on young children (Cairns et al. 2013; Hastings et al. 2003; Jenkin et al. 2014), whereas research on older adolescents and adult populations are relatively limited (Anderson et al. 2009; Mills et al. 2012; Smith & Foxcroft 2009). One review systematically assessed the evidence of experimental intervention studies of food and beverages promotion to adults (16 years and above) but could not draw a conclusive outcome from the sparse studies conducted on adults (Mills et al. 2012). In two systematic reviews that summarized evidence from prospective cohort studies on alcohol promoted to adolescents and young adults through traditional media, marketing was linked to early onset of drinking (Anderson et al. 2009) and current alcohol consumption (Smith & Foxcroft 2009). Public health researchers have called for greater policy and research attention on the effect of marketing on behaviours and for this to be extended to adolescents and young adults due to the rising overweight and obesity rates (Allman-Farinelli et al. 2008; Freeman et al. 2015) and the lack of regulations in restricting unhealthy commodities, particularly EDNP food and beverages, towards these age groups (Freeman et al. 2015).

Adolescents and young adults have a strong online presence and growing purchase power and are viewed by digital marketers as a lucrative market segment (Freeman et al. 2015; Montgomery et al. 2012). Yet only a few studies have assessed the use of digital media to promote unhealthy commodities to these age groups by the food and beverages (Freeman et al. 2015), tobacco (Harper and Martin 2002) and alcohol (McCreanor et al. 2012) industries and these studies have only looked at one unhealthy commodity in isolation due to different research interests. There are parallels in the marketing techniques used between these different product categories and so collective review evidence of effects may be useful. The aims of this review were to: (i) systematically assess the findings from empirical studies that evaluate the association between digital marketing and young people's attitudes and behaviours towards unhealthy commodities; and (ii) collate findings to provide an overview of how this novel form of marketing exerts its influences on young people. This review will be valuable for the public health community and policymakers to assist their understandings of the contributions of digital marketing to the use of unhealthy commodities and the need for policy interventions, for example regulatory interventions to restrict this marketing and programs to counter the effects of unhealthy digital marketing.

2.2.3 Materials and Methods

This review is reported consistent with the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines (Moher et al. 2009). The protocol was registered with the PROSPERO International Prospective Register of Systematic Review before commencing of data extraction (PROSPERO 2018) (see protocol registration number: CRD42017076682). A systematic literature search was conducted in June 2017 on databases including Business Source Complete, Emerald Insight, ProQuest Central, PsycINFO, Scopus and Web of Science for articles published between 1990 and 2017 and whose title, abstract

and keywords matched the following Boolean search strings: (market* OR advert* OR promot*) AND (online OR internet OR web OR "social media" OR "social network" OR "new media" OR "online game" OR advergam*) AND ("young people" OR "young adults" OR "young generation" OR "university students" OR "college students" OR adolescents OR teenagers OR youths) AND NOT (child*) AND (food OR beverage OR drink OR soda OR cola OR alcohol OR tobacco OR cigarette). The full record of search strings on Scopus is shown in Table 2.1. Additional searches for suitable studies were conducted on Google Scholar, websites and grey literature sources. Reference lists of the identified articles and key reviews were hand-searched for further studies.

Table 2.1: Search parameters for Systematic Review of the digital marketing effects on young people: Example on Scopus

Operator	Definition	Hits
1. Title, Abstract, Keywords	market* OR advert* OR promot*	2,487,973
2. Title, Abstract, Keywords	online OR internet OR web OR "social media" OR "social network" OR "new media" OR "online game" OR advergam*	1,156,990
3. Title, Abstract, Keywords	"young people" OR "young adults" OR "young generation" OR "university students" OR "college students" OR adolescents OR teenagers OR youths	2,634,580
4. Title, Abstract, Keywords	child*	2,898,753
5. Title, Abstract, Keywords	food OR beverage OR drink OR soda OR cola OR alcohol OR tobacco OR cigarette	2,070,463
6. Boolean operator	#1 AND #2 AND #3 AND NOT #4 AND #5	931
7. Limit date range	1990–2017	780
Limit language	English	
Limit document type	Article	

Studies were included if they met the following criteria: (1) Primary studies published in peer-reviewed journals or on relevant websites; not reviews or commentaries; (2) Study participants were aged 12 to 30 years; studies with a sample of broader age range were only included if the target age group was analyzed separately. Australian Bureau of Statistics (ABS) identified adolescents and young adults aged 15–34 years as the biggest Internet users (98%) followed by adolescents aged under 15 years (97%) (Australian Bureau of Statistics 2016). The age range of 12 to 30 years was selected since many studies have used 12 years as a starting year for adolescents and 30 years as a cut-off for young adults; (3) Study factors included any marketing or promotion of unhealthy commodities including food and beverages, tobacco and alcohol generated by the product industry using online platforms such as Internet, websites, SNS, online games and emails. Studies that examined the marketing impact of digital media as well as traditional media were included if the effects of digital marketing were analyzed separately. Studies that examined the user-generated online contents were excluded; (4) Indicators of outcome included psychological measures such as perception and attitudes, purchase and consumption intentions, purchase and consumption behaviours (for the simplicity, hereby collectively referred to as "attitudes and behaviours"); and (5) Studies based on content analyses were excluded as outcome variables were often not examined in this type of study.

Title and abstract of the identified references were pre-screened for relevance by the lead reviewer (L.B.). Two independent reviewers (L.B., K.K.) then assessed the full-text articles in detail based on the exclusion criteria. When there were discrepancies between the two reviewers, a third reviewer (B.K.) was consulted. A consensus was then reached through discussion of evaluations. Data of the included studies were extracted and recorded in a tabulated summary by the lead reviewer. Details recorded in the template included date,

location, participants' demographics, sample size, study aims, study designs, study factors, outcome measures, results and control variables. Overall association between the study factors and outcome measures were determined and categorized into: significant detrimental association (e.g., increased exposure enhanced unhealthy commodities use); significant beneficial association (e.g., increased exposure reduced unhealthy commodities use); association cannot be determined; or inconsistent association (e.g., a mixture of detrimental, beneficial, or no association). The second reviewer (K.K.) verified the extractions.

Due to the heterogeneity of the study designs, study factors and outcome measures of the included studies (see Results section), meta-analysis was deemed inappropriate and qualitative narrative synthesis was used to combine the overall findings of the reviewed studies. Quality appraisals were conducted by using the NIH (National Institute of Health-National Heart, Lung and Blood Institute, Bethesda, MD, USA) (cross-sectional, longitudinal and controlled intervention studies) or CASP (Critical Appraisal Skills Program) (qualitative studies) assessment tools (Critical Appraisal Skills Programme 2017; NHLBI and NIH 2014b; NHLBI and NIH 2014a). Each tool can be generally divided into four domains: study setup, sample selection, assessment and data analysis. Each domain was rated good, fair or poor. Studies included in the review were appraised by the lead reviewer in consultation with the second and third reviewers.

2.2.4 Results

Database searches identified 2295 records, with 1206 records remaining after duplicates were removed. The primary screening excluded 1117 records; the remaining 89 full-text articles were assessed in detail and 24 met the inclusion criteria. An additional four studies were

identified through the reference lists of the identified articles and grey literature sources. A total of 28 articles were included in this review (Figure 2.1).

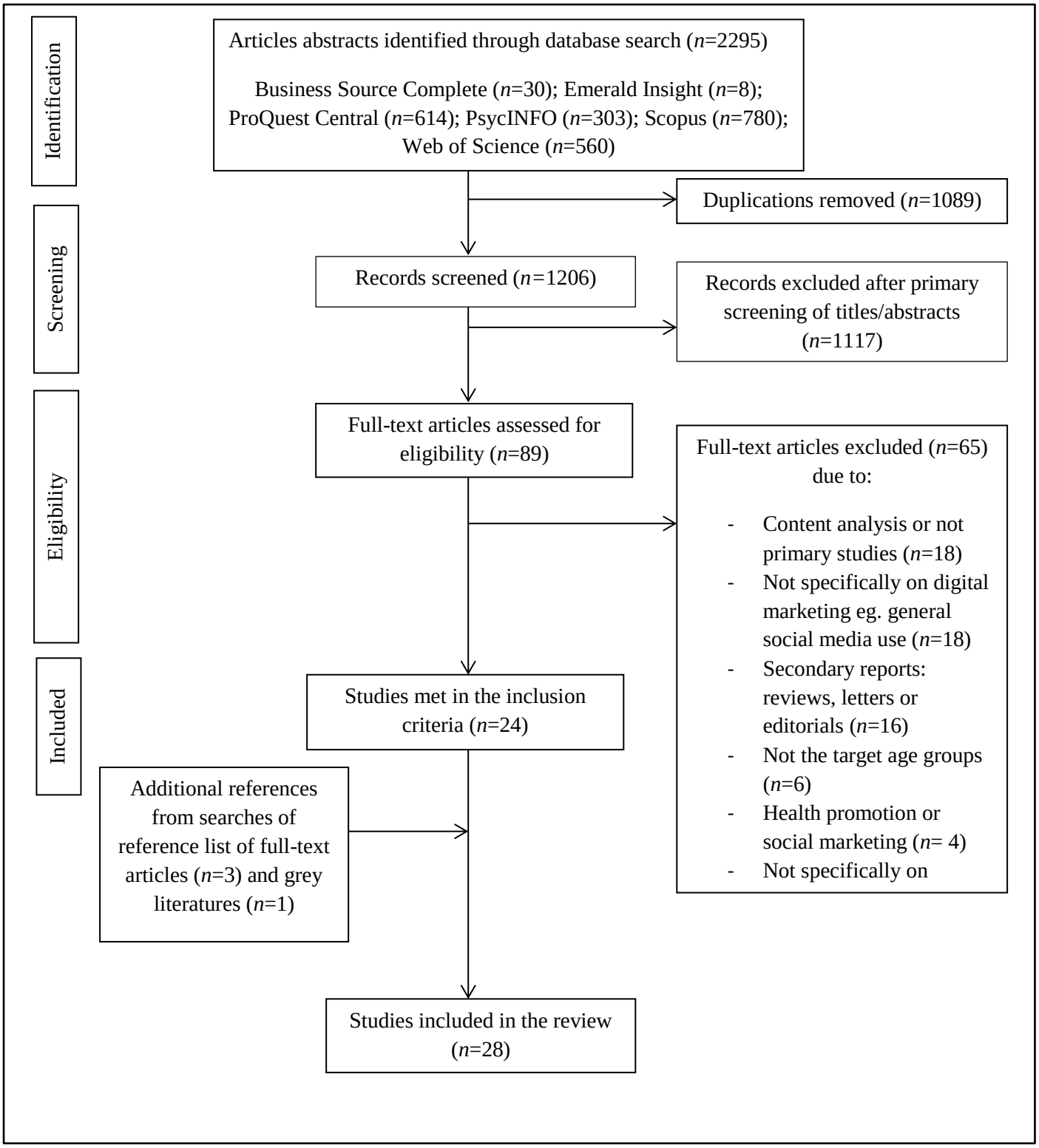

Figure 2.1: Flow chart of systematic review literature search

The included 28 studies were published between 2001 and 2017 (Tables 2.2 and 2.3). The majority of the studies were conducted in economically developed countries (*n* = 24): Australia (*n* = 9) (Buchanan et al. 2017; Carrotte et al. 2016; Dunlop et al. 2016; Hoffman et al. 2014; Jones & Magee 2011; Jones et al. 2016; Perez et al. 2012; Scully et al. 2012; Weaver et al. 2016), USA (*n* = 5) (Alhabash et al. 2015; Depue et al. 2015; McClure et al. 2016; Reinhold et al. 2017; Singh et al. 2016), UK (*n* = 6) (Atkinson et al. 2017; Critchlow et al. 2016; Gordon et al. 2011; MacFadyen et al. 2001; Moraes et al. 2014; Purves et al. 2018) and New Zealand (*n* = 3) (Lin et al. 2012; Lyons et al. 2015; Niland et al. 2017). One study included data collected from four countries—Germany, Italy, the Netherlands and Poland (de Bruijn et al. 2016). One study was conducted in each of Argentina (Salgado et al. 2014), Brazil (Pinsky et al. 2010), Egypt (Gaber & Wright 2014) and Fiji (Waqa et al. 2015). The included studies reported data on 7 to 22,007 participants aged 12 to 30 years. Of these, six studies drew findings from state-wide or national samples (de Bruijn et al. 2016; Perez et al. 2012; Singh et al. 2016; Carrotte et al. 2016; Dunlop et al. 2016; Scully et al. 2012). The majority of the included studies examined marketing effects of alcohol (*n* = 18) (Carrotte et al. 2016; Hoffman et al. 2014; Jones & Magee 2011; Jones et al. 2016; Weaver et al. 2016; Alhabash et al. 2015; McClure et al. 2016; Critchlow et al. 2016; Gordon et al. 2011; Atkinson et al. 2017; Lin et al. 2012; Lyons et al. 2015; Moraes et al. 2014; Niland et al. 2017; Purves 2015; Pinsky et al. 2010; Waqa et al. 2015), some were of tobacco or e-cigarettes (*n* = 7) (Dunlop et al. 2016; Perez et al. 2012; Depue et al. 2015; Reinhold et al. 2017; Singh et al. 2016; MacFadyen et al. 2001; Salgado et al. 2014) and a small number were on EDNP food or beverages (*n* = 3) (Buchanan et al. 2017; Gaber & Wright 2014; Scully et al. 2012).

Eleven of the included studies investigated the effects of unhealthy commodities marketed through digital media as well as traditional media (Jones & Magee 2011; Perez et al. 2012; Scully et al. 2012; Depue et al. 2015; Critchlow et al. 2016; Gordon et al. 2011; Reinhold et al. 2017; Singh et al. 2016; MacFadyen et al. 2001; Lin et al. 2012; Pinsky et al. 2010). Seventeen studies specifically examined marketing impacts of unhealthy commodities through digital communications (Buchanan et al. 2017; Carrotte et al. 2016; Dunlop et al. 2016; Hoffman et al. 2014; Jones & Magee 2011; Alhabash et al. 2015; Weaver et al. 2016; McClure et al. 2016; Atkinson et al. 2017; Moraes et al. 2014; Purves 2015; de Bruijn et al. 2016; Lyons et al. 2015; Niland et al. 2017; Salgado et al. 2014; Gaber & Wright 2014; Waqa et al. 2015). Where percentage data were available, the reported prevalence of exposure to, or engagement with, digital marketing ranged from 5% to 88%; only four studies reported greater than 50% rates (Carrotte et al. 2016; Critchlow et al. 2016; de Bruijn et al. 2016; Hoffman et al. 2014). The outcomes of interest of the included studies were classified into three categories, with some studies measuring more than one outcome variable: attitudes (i.e. beliefs, perceptions of brands or products) (n = 10) (Buchanan et al. 2017; Reinhold et al. 2017; Weaver et al. 2016; Atkinson et al. 2017; Moraes et al. 2014; Purves 2015; Gaber & Wright 2014; Lyons et al. 2015; Niland et al. 2017; Waqa et al. 2015), intended use (n = 9) (Alhabash et al. 2015; Buchanan et al. 2017; Carrotte et al. 2016; de Bruijn et al. 2016; Dunlop et al. 2016; Gordon et al. 2011; Jones & Magee 2011; Lin et al. 2012; McClure et al. 2016) and current use (n = 17) (Carrotte et al. 2016; Dunlop et al. 2016; Hoffman et al. 2014; Jones et al. 2016; Perez et al. 2012; Scully et al. 2012; Critchlow et al. 2016; Depue et al. 2015; Gordon et al. 2011; MacFadyen et al. 2001; McClure et al. 2016; Singh et al. 2016; de Bruijn et al. 2016; Lin et al. 2012; Pinsky et al. 2010; Salgado et al. 2014; Jones & Magee 2011) of unhealthy commodities.

It was difficult to quantify the volume of studies that found a detrimental association between digital marketing and attitudes or behaviours given that most of the included studies examined more than one form of digital marketing or outcome measure and mixed findings were found in some. Inconsistency of the direction of associations were found in eight studies (Dunlop et al. 2016; Jones et al. 2016; Perez et al. 2012; Alhabash et al. 2015; Lin et al. 2012; McClure et al. 2016; Reinhold et al. 2017; Salgado et al. 2014) but all studies found at least one significant detrimental association between the examined study factors and outcome measures. Among the rest of the studies, nine studies found consistent significant detrimental associations (Buchanan et al. 2017; Carrotte et al. 2016; Hoffman et al. 2014; Depue et al. 2015; Gordon et al. 2011; MacFadyen et al. 2001; Niland et al. 2017; Scully et al. 2012; Singh et al. 2016), one study found consistent significant beneficial associations (Perez et al. 2012) and associations could not be determined in three studies (MacFadyen et al. 2001; Pinsky et al. 2010; Scully et al. 2012) since regression analyses were not performed although descriptive data (e.g., percentage of exposure rate) were used to suggest the relationship (Table 2.2). The effects of digital marketing are therefore discussed by three outcomes of interest categories in the following sections.

Detrimental effects on young people's attitudes towards unhealthy commodities or brands were demonstrated in two quantitative studies (Buchanan et al. 2017; Reinhold et al. 2017) and supported by five qualitative studies (Atkinson et al. 2017; de Lenne; Lyons et al. 2015; Moraes et al. 2014; Niland et al. 2017; Weaver et al. 2016) (Tables 2.2 and 2.3). One study found that participants' interests in energy drinks was enhanced by the social corporate responsibility efforts and masculine images created by the energy drink brands after being exposed to the brands' websites and SNS (Buchanan et al. 2017). Another study linked e-cigarette advertisements on the Internet to lower perceived harm and greater acceptability of

these products among university students (Reinhold et al. 2017). Association in one study cannot be determined given that only descriptive analyses were conducted. However, this study reported that digital alcohol marketing was perceived by their focus group participants to have improved mood and confidence among young people and young people preferred marketing contents on Facebook that seemed ‘user-generated’ or ‘subtle’ in appearance (Weaver et al. 2016).

The qualitative studies reported that young people were skeptical towards the advertisements on sidebars (Facebook) or brand-sponsored advertisements (Moraes et al. 2014; Niland et al. 2017) but they did not necessarily view their engagement with brand-related contents on SNS (i.e., “liking” or “sharing”) as a form of marketing, especially when these were shared by their peers (Atkinson et al. 2017; Lyons et al. 2015; Niland et al. 2017). Two studies also revealed the social acceptability to be seen consuming certain alcohol brands on SNS as these brands were linked to desired masculinity, femininity and cultural images (Atkinson et al. 2017; Niland et al. 2017).

Table 2.2: Characteristics and results of the included quantitative studies

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Alhabash et al. (2015)	University students from introductory classes, mean age 21 years *n* = 379 (USA)	To examine the effects of viral behavioural intentions (intentions to like, share and comment on) for status updates and display advertisements on social media users' intentions to consume alcohol	Experimental Design: 2 (likes: low vs high) × 2 (shares: low vs high) × (display ad type: alcohol ad vs anti-binge drinking Public Service Announcement (PSA) vs local bank) × 6 (status update repetitions) (Controlled intervention study)	Likes and shares on Facebook (Objectively measured)	Attitudes and viral behavioural intentions towards the display advertisements and status updates Intention to consume alcohol (Alcohol) (Self-reported)	Attitude towards status updates (B = 0.2, t = 4.5, p < 0.00) and viral behavioural intentions towards status updates (B = 0.5, t = 6.6, p < 0.00) positively predicted alcohol consumption intention. Attitudes towards ads display (B = −0.1, t = −1.6, ns) and viral behavioural intentions towards ads display (B = 0.1, t = 1.9, p = 0.06) did not predict alcohol consumption intention. No variables were adjusted. (Inconsistent association)
Buchanan et al. (2017)	Young adults aged 18–24 years *n* = 60 (Australia)	To assess the impact of online marketing on young adults' perception and consumption behaviours, using energy drinks as an example	Pre-test/post-test experimental trial, followed by semi-structured interview (Controlled intervention study)	Experimental group: exposure to two energy drink brands website and social media sites (Objectively measured)	Attitudes towards, purchase intention and consumption intention of, the two exposed energy drinks brands and energy drinks products in general (Energy drinks) (Self-reported)	Exposure to energy drinks online marketing content improved young adults' attitudes towards ($t(50)$ = −4.5, p = 0.00) and increased consumption intention of ($\chi^2(1)$ = 7.9, p = 0.01), energy drinks products. No variables were adjusted. (Significant detrimental association)
Carrotte et al. (2016)	Young people aged 15–29 years *n* = 1001 (Australia)	To explore the relationship between alcohol marketing on social media and alcohol consumption among young people	Online survey (Cross-sectional study)	Alcohol marketing social media use "like/follow pages on Facebook,	Alcohol consumption (number of standard drinks consumed on a typical day of drinking and risky single	Liking or following any alcohol marketing page was significantly associated with early age (10–14 years) of first alcohol consumption (AOR = 2.2, 95% CI

				Instagram or Twitter" (Self-reported)	occasion drinking) age of initiation of drinking (Alcohol) (Self-reported)	= 1.6–3.0). Higher AUDIT-C (more risky alcohol consumption) were associated with liking or following alcohol marketing pages (AOR = 2.1, 95% CI = 1.5–2.8). Adjusted variables: Gender, age, education, location, sexuality, country of birth, recreational spending per week, recent mental health problems, ever used illegal drugs, age at first alcohol consumption (Significant detrimental association)
Critchlow et al. (2016)	Young people aged 18–25 years *n* = 405 (UK)	To examine the relationship between awareness of traditional, digital marketing and young people's frequency of high episodic drinking (HED)	Survey (Cross-sectional study)	Awareness of and participation with 11 digital marketing channels,' awareness of nine traditional marketing channels (Self-reported)	Frequency of high episodic drinking (HED) (Alcohol) (Self-reported)	Participation with digital marketing increased the frequency of HED ($B = 0.2$, $p < 0.00$). Adjusted: Awareness of traditional alcohol marketing (Significant detrimental association)
De Bruijn et al. (2016)	European youths, mean age 14years *n* = 9032 (Germany, Italy, Netherlands, Poland)	To examine the exposure to alcohol marketing through digital media and its association with initiation of alcohol use, recent binge drinking and volume of alcohol consumption	Survey (Cross-sectional study)	Frequency of exposure to alcohol marketing in online media. (Self-reported)	Alcohol use (Alcohol) (Self-reported)	Exposure to online alcohol marketing was linked to an increase likelihood of beginning alcohol use and binge drinking in the past 30 days. The association was the strongest for: looked at a website for alcohol brands (onset of drinking AOR = 1.1, 95% CI =1.1–1.2; past 30 days binge drinking AOR = 1.11, 95% CI = 1.1–1.2) downloaded alcohol-branded screensaver (onset of drinking

						AOR = 1.1, 95% CI = 1.1–1.2; past 30 days binge drinking AOR = 1.1, 95% CI = 1.1–1.2). Exposure to online alcohol ad increased the odds of being a drinker (AOR = 1.3, 95% CI = 1.2–1.4) and binge drinking (AOR = 1.24, 95% CI = 1.2–1.3) Adjusted: gender, smoking, age, education level, religious constraints against alcohol, alcohol use peers, alcohol use mother, peer permission to drink, maternal permission to drink. (Significant detrimental association)
Depue et al. (2015)	Connecticut residents aged 18–24 years *n* = 200 (USA)	To assess the association between smoking behaviour and the exposure to mass media depictions of smoking on social networking websites	Telephone surveys (wave 1 and wave 2–5 months apart) (Longitudinal study)	See tobacco use on TV, in movies and in social media content such as Facebook or MySpace (Self-reported)	Cigarette use in the past 30 days (Tobacco) (Self-reported)	Time 1 social media tobacco use was a significant predictor of smoking at Time 2 (OR = 1.6, $p < 0.05$). Social media tobacco use had a moderate correlation to both time ($r = 0.2$, $p < 0.05$) and time 2 ($r = 0.2$, $p < 0.05$) Not adjusted: sex, race, friends and family tobacco use, sensation-seeking Social media depictions of tobacco use were associated with future smoking tendency (Significant detrimental association)
Dunlop et al. (2016)	Young people in two Australian states aged 12–24 years *n* = 8820	To assess the exposure of young Australians to online tobacco advertising and promotion and to determine whether exposure has changed in recent year in relation to the changes in	Telephone surveys (four waves) (Repeat cross-sectional study)	Exposure to Internet-based tobacco advertising and branding in the past month (Self-reported)	Smoking behaviours: Current smoking (never-smokers; experimenters; current smokers; ex-smokers), smoking susceptibility (Tobacco)	Current or ex-smokers had lower odds of being exposed to Internet-based advertising than experimenters or never-smokers (AOR = 0.4, 95% CI = 0.3–0.5) Non-smokers aged 12–17 years, exposure to online advertising and

	(Australia)	tobacco promotion opportunities			(Self-reported)	branding (OR = 1.3, 95% CI = 1.1–1.6) or branding alone (OR = 1.4, 95% CI = 1.1–1.8) increased their susceptibility to smoking Adjusted: demographic characteristics, year of Interview, average daily Internet use, SES status, smoking exposures (friends, household) (Inconsistent association)
Gordon et al. (2011)	Students attending schools in the West of Scotland, aged 12–14 years *n* = 920 (UK)	To examine the cumulative impact of alcohol marketing communications on adolescents' drinking behaviours	Survey (Cross-sectional study)	Awareness, appreciation and involvement with various forms of alcohol marketing including digital marketing, as measured by interview-administered questionnaire (Self-reported)	Drinking status, future drinking intentions, age of initiation of drinking, as measured by self-completion questionnaire (Alcohol) (Self-reported)	Participation in electronic alcohol marketing increased the likelihood of being a drinker (OR = 4.0, 95% CI = 1.5–10.8) and associated with greater intention to drink alcohol in the next year ($B = 0.1$, $p < 0.01$) Adjusted: perceived parental attitudes towards drinking and alcohol consumptions, perceived siblings and peers' attitudes towards drinking and alcohol consumption, liking of adverts in general and liking of alcohol adverts in particular, age (Significant detrimental association)
Hoffman et al. (2014)	Public and private university students, mean age 21.4 years *n* = 637 (USA)	To examine the relationship between college students' use of social media, their exposure to alcohol marketing messages through social media and their alcohol-related beliefs and behaviours	Online survey (Cross-sectional study)	Engage with alcohol related marketing on the websites and social media sites. (Self-reported)	Drinking behaviours: problem drinking as measured by problem-drinking index, use in past 30 days, use in 1 occasion. (Alcohol) (Self-reported)	The use of alcohol-marketing applications on social media predicted: more drinking problems ($B = 0.3$, $p < 0.00$), more frequent alcohol use in past 30 days ($B = 0.2$, $p < 0.00$), heavier consumption in a single occasion ($B = 0.2$, $p < 0.00$) Adjusted: private or public university affiliation, demographic variables included sex, age, reported family income,

						reported grades in school, expectations for educational attainment, year in college (Significant detrimental association)
Jones & Magee (2011)	Adolescents aged 12–17 years *n* = 1113 (Australia)	To investigate the exposure level to different types of alcohol advertising and to examine the association between exposure to advertising and alcohol consumption	Survey (Cross-sectional study)	Exposure to alcohol advertisement across eight media including Internet (Self-reported)	Alcohol consumption behaviours (initiation, recent consumption in the past 4 weeks and frequency of consumption in the previous 12 months) (Alcohol) (Self-reported)	Exposure to Internet alcohol advertising increased the likelihood of recent alcohol consumption (AOR = 1.4, 95% CI = 1.0–1.8) but not the alcohol initiation (AOR = 1.3, 95% CI = 0.9–1.7) or alcohol consumption in the past 12 months (AOR = 1.0, 95% CI = 0.7–1.3) Adjusted: age, gender, country of birth, religion, mother's alcohol consumption, father's alcohol consumption, siblings' alcohol consumption, friends' alcohol consumption, source of recruitment. (Inconsistent association)
Jones et al. (2016)	Young people aged 16–24 years *n* = 283 (Australia)	To examine the association between Facebook users' interactions with alcohol brands and alcohol consumption	Online survey (Cross-sectional study)	Recalled exposure to alcohol marketing on Facebook, interaction with alcohol brands on Facebook (e.g., liking, commenting) (Self-reported)	Alcohol use amount (1–2 drinks, 3–4 drinks and more than 5 drinks), alcohol use frequency, binge drinking frequency as measured by AUDIT-C. (Alcohol) (Self-reported)	Respondents who had ever liked, posted, commented or uploaded/tagged alcohol brands on Facebook increased the alcohol use frequency (OR = 2.0, 95% CI = 1.2–3.5); increased alcohol amount use (OR = 3.7, 95% CI = 2.1–6.7), increased binge drinking frequency (OR = 2.4, 95% CI = 1.4–4.2) No association was found between the quantity of alcohol consumed and having visited an alcohol's Facebook page, visited an alcohol website by clicking the link on Facebook, or viewed an event created/sponsored by an

						alcohol company Adjusted: socio-demographic backgrounds (Inconsistent association)
Lin et al. (2012)	Students aged 13–14 years *n* = 2538 (New Zealand)	To examine to association between awareness and engagement with a range of alcohol marketing channels and drinking behaviours	Computer assisted telephone interview (Cross-sectional study)	Awareness of and engagement with 15 of alcohol marketing channels including web based marketing, as measured by interview-administered questionnaire (Self-reported)	Drinking status, drinking frequency, drinking quantity and future drinking intentions, as measured by interview-administered questionnaire (Alcohol) (Self-reported)	Those engaged with web-based alcohol marketing were: More likely to be drinkers (OR = 1.9, 95% CI = 1.2–3.0) More likely to have drunk alcohol in the past 12 months (OR = 2.0, 95% CI = 1.2–3.2), Less likely to drink alcohol on a typical occasion (OR = 0.7, 95% CI = 0.5–1.0) Not significantly related to drinking intention (OR = 1.0, 95% CI = 0.4–2.2) or drinking frequency (OR = 0.9, 95% CI = 0.6–1.2) Adjusted: age, gender, ethnicity, drinking behaviours and perceived drinking approval of parents, siblings and friends (Inconsistent association)
MacFadyen et al. (2001)	Young people aged 15 and 16 years *n* = 629 (UK)	To examine the association between young people's awareness of and involvement with tobacco marketing and their smoking behaviour	Survey (Cross-sectional study)	Exposure and involvement to all forms of tobacco marketing activities including Internet sites (Self-reported)	Smoking status (non-smoker; tried smoking; current smoker) (Tobacco) (Self-reported)	There was a low number of participants (8%) who were aware of the Internet sites for cigarettes or smoking and their smoking status were not significantly different (p = 0.36). Digital marketing exposure and involvement variables were not included in the regression models. Adjusted: gender, age, friends' smoking, sibling's smoking, mother's smoking and father's smoking, socioeconomic group, marital status of parents, future education intentions and parental

						presence during interviews (Association cannot be determined)
McClure et al. (2016)	Youths aged 15–20 years *n* = 2012 (USA)	To examine the longitudinal association between Internet alcohol marketing engagement and alcohol use transitions among youth	Surveys were conducted at two time points (1 year apart) (Longitudinal study)	Internet alcohol marketing receptivity: exposure to alcohol advertising on the Internet, visiting alcohol brand websites, being an online alcohol brand fan (Self-reported)	Ever drinking and binge drinking (6 or more drinks per occasion) (Alcohol) (Self-reported)	Internet alcohol marketing receptivity increased the likelihood of initiating binge drinking, the higher the receptivity score, the greater the impact (score 1: OR = 1.8, 95% CI = 1.1–2.8; score 2: OR = 2.2, 95% CI = 1.1–4.4) However, Internet alcohol marketing was not associated with the initiation of ever drinking (score 1: OR = 1.2, 95% CI = 0.8–1.9; score 2: OR = 1.1, 95% CI = 0.3–3.8, ns) Adjusted: baseline drinking status, socio-demographics, peer drinking, parent drinking, general time spent on the Internet, sensation seeking (Inconsistent association)
Perez et al. (2012)	Adolescents and young adults aged 12 to 24 years *n* = 1000 (Australia)	To examine the level of exposure of New South Wales (NSW) adolescents and young adults to the promotion of tobacco through point-of-sale, Internet, entertainment media and venues and to identify young people who are at risk of exposure	Telephone survey (Cross-sectional study)	Perceived exposure to promotion or advertising of tobacco in the last month through various forms of marketing methods including Internet (Self-reported)	Smoking status (current smokers, ex-smokers, experimenters, non-smokers) and susceptibility to smoking (susceptible non-smokers, non-susceptible non-smokers) (Tobacco) (Self-reported)	Participants who had ever smoke had lower odds of seeing cigarette brands, tobacco company names or logos on the Internet (OR = 0.6, 95% CI = 0.4–1.0) than those who never smoke. Adjusted: age, sex, Socio-economic status (SES), income, household smoking, friends smoking, Internet use (Significant beneficial association)
Pinsky et al. (2010)	Subjects aged 14–25 years *n*= 1091	To explore Brazilian adolescents and young adults' exposure to alcohol advertising and to assess the	Face-to-face interviews but quantitative questions (Cross-sectional	Perceived exposure to alcohol marketing in different media	Alcohol consumption: high intensity drinkers (drink at least once a week) vs. low intensity	91.6% declared they have not seen alcohol advertising on the Internet or visited a website related to alcohol beverages.

	(Brazil)	relationship between the exposure to heavy alcohol consumption	study)	including Internet (Self-reported)	drinkers (drink less than once a week) (Alcohol) (Self-reported)	Exposure to alcohol Internet sites was not included in the logistic models, due to low incidence of reported exposure Adjusted: intensity of alcohol consumption, sociodemographic backgrounds (Association cannot be determined)
Reinhold et al. (2017)	Students at a large Midwestern university aged 18–24 years *n* = 5983 (USA)	To explore young adults' perceptions of harm and acceptability of the use of e-cigarette and to examine whether e-cigarette advertising has an effect on perception of harm and acceptability of use	Online survey (Cross-sectional study)	E-cigarette advertising exposure through different media channels including Internet (Self-reported)	Lifetime e-cigarette use, perception of harm, addictiveness and acceptability of e-cigarette use in places (E-cigarette) (Self-reported)	Having seen an advertisement on the Internet was significantly associated with lower perceived harm of e-cigarette use (AOR = 1.2, 95% CI = 1.1–1.3) and also acceptability of e-cigarette use in various locations (all $p < 0.00$) Having seen advertisement on the Internet was not associated with the lower perceived addictiveness of e-cigarette (AOR = 1.1, 95% CI = 1.0–1.2, ns) Adjusted: maternal smoking status, smoking history, gender, race, exposure to advertising on other platforms (TV, magazine) (Inconsistent association)
Salgado et al. (2014)	Current or recently graduated medical students aged 20–30 years *n* = 1659 (Argentina)	To examine the effects of tobacco industry Internet marketing strategies on young adults	Survey (Cross-sectional study)	Frequency of access to tobacco website (from "once a day or more" to "once a month or less"). (Self-reported)	Ever smoke, never smoke, current smoker, former smoker (Tobacco) (Self-reported)	Former or current smokers were more likely to have accessed a tobacco brand website at least once (AOR = 2.5, 95% CI = 1.4–4.2; AOR = 8.1, 95% CI = 4.7–14.2, respectively) Current smokers were less likely to report having seen a tobacco advertisement on the Internet (AOR = 0.6, 95%CI = 0.5–0.8) Adjusted: age, daily use of Internet, received tobacco marketing promotion, used

						tobacco marketing promotion (Inconsistent association)
Scully et al. (2012)	Secondary students aged 12–17 years *n* = 12,188 (Australia)	To determine the associations between exposure to various types of food marketing and adolescents' food choices and food consumption	Online survey (Cross-sectional study)	Various types of food marketing exposure including Internet (Self-reported)	Food choices, eating behaviours- frequency of consumption of fast food, sugary drinks and sweet snacks (Energy-dense and nutrient poor (EDNP) foods) (Self-reported)	Exposure to the digital food marketing increased the odds: To consume fast food one exposure source (OR = 1.2, 95% CI = 1.1–1.4) two exposure sources (OR = 2.3, 95% CI = 1.9–2.7) To consume sugary drinks two exposure sources (OR = 1.3, 95% CI = 1.1–1.6) To consume salty snacks two exposure sources (OR = 1.3, 95% CI = 1.1–1.5) Adjusted: gender, school year, geographic location of residence, socio-economic position (SEP), body mass index (BMI), school level (Significant detrimental association)
Singh et al. (2016)	Middle and high school students grades 6 to 12 (12–18 years) *n* = 22007 (USA)	To examine the association between e-cigarette advertising exposure (four sorts including Internet) and current e-cigarette use among US youth	Survey (Cross-sectional study)	Exposure to e-cigarette advertisement on Internet, newspaper/magazines, in retail stores, in TV/movies (Self-reported)	Current cigarette use (in the past 30 days) (E-cigarette) (Self-reported)	Among middle school students, greater exposure to e-cigarette Internet advertising increased the odds of being current e-cigarette users (most of the time/always AOR = 2.9, 95% CI = 1.9–4.5) Among high school students, greater exposure to e-cigarette Internet advertising increased the odds of being current e-cigarette users (most of the time/always AOR = 2.0, 95% CI = 1.7–2.5) Adjusted: gender, ethnicity, grade, other tobacco use (Significant detrimental association)

Weaver et al. (2016)	Young people aged 16–29 years *n* = 172 (Australia)	To investigate young people's perception of alcohol advertising on Facebook and to investigate the perceived compliance of these advertising with the Alcohol Beverages Advertising Code (ABAC)	Focused group discussion (to inform development of online survey) Online survey (Cross-sectional study)	Exposed to six popular Australian alcohol brands' Facebook pages (Self-reported)	Perception and interpretation of specific alcohol-branded marketing on Facebook, as measured by open-ended questions (with and without prompts). Drinking behaviours (Alcohol) (Self-reported—a mixture of quantitative and qualitative findings)	The focused group discussion revealed that participants preferred alcohol advertising that was 'user-generated', 'casual' and 'subtle' in appearance as it gives the impression that it was created by a 'real person' Association with success was also the most frequently reported message, for example, 'drinking is a social event and aids in the betterment of your social status' With prompts, participants reported that alcohol advertising made them feel more relax (67%), improved mood (65%), feel more social and outgoing (57%) and confident (49%) Measured but not adjusted: age, sex, education levels, favorite type of alcohol (Association cannot be determined)

PSA: Public Service Announcement ; *B*: Standardized regression coefficients ; *p*: Level of marginal significance; AOR: Adjusted odds ratio ; CI: Confidence Interval; SES: Socio-economic status.

Table 2.3: Characteristics and results of the included qualitative studies

No.	Author (Date)	Population (Country)	Study Aim (Product)	Data Collection	Results
1	Atkinson et al. (2017)	Young people aged 16–21 years *n* = 70 (UK)	To analyze the use and contents of alcohol marketing on the social network sites (SNS) and to explore young people's perspectives and experiences on alcohol marketing on SNS (Alcohol)	Stage 1: Content analysis of five alcohol brands' interaction with users on social networking sites; both brand- and user-generated contents over 1-month period Stage 2: Fourteen semi-structured interviews with peer groups of young people	Alcohol industry used social networking site particularly Facebook to engage consumers Branding of alcohol appealed young people. The social acceptability of consuming certain drinks and brands and being 'seen' drinking these on SNS were influenced by the connotations of masculinity, femininity and maturity Influence of SNS marketing on young people was mediated through their peers' online activities- engagement with alcohol on SNS reported to be done through young people's news feed as a result of their friend's interaction or through third party content (e.g., music and sporting events)
2	Gaber & Wright (2014)	Young people aged 17–29 years *n* = 40 (Egypt)	To explore the factors that influence young Egyptians' attitudes towards fast-food advertising on Facebook. (Fast-food)	Focus groups Content analysis	Most of the participants had positive attitudes towards the advertising on Facebook and believed that Facebook advertising is informative and credible Participants preferred Facebook advertising over web advertisements that appear pop up causing a big amount of inconvenience and interruption Having friends who also liked or commented on the Fast food Facebook pages increased the likelihood of consumers clicked on the advertisement or tried the brands
3	Lyons et al. (2015)	18–25 years old young people *n* = 141 (focus group discussion) *n* = 23 (individual interviews)	To use an innovative qualitative methodology to explore the role of social networking site in drinking cultures and alcohol consumption practices among young adults (Alcohol)	Stage 1: Focus group discussion Stage 2: Individual interviews with Internet-enabled laptop (digital navigation software to store all online activities) Stage 3: Analysis of a database of web-based materials that were mentioned or shown by participants in Stage 1 and 2	Alcohol companies use social media to enhance identity displays; participants actively engaged with these marketing initiatives with many highlighted that alcohol brands and pages were integral part of their online identities; allowed them to present their tastes and preferences and socially interacted with the other Facebook users by sharing amusing alcohol-related content generated by alcohol companies

		(New Zealand)			Participants do not necessarily view alcohol product pages and promotions on Facebook as advertising; alcohol marketing on Facebook involved Facebook friend relationships, that is, appear in group links, news feeds and status updates which are the in the same manner as friends' postings
4	Moraes et al. (2014)	Young adults aged 18 to 24 years *n* = 15 (UK)	To explore the use of Facebook to promote alcohol use among young people (Alcohol)	Focus group Netnographic study (apply the ethnographic research methods to study the cultures and communities that emerged through computer-mediated communications)	Facebook was used as a tool by alcohol brands and nightclub to communicate, co-produce and co-generate alcohol-related contents with young people that encourages alcohol use Wall comments, drinking-related group memberships, events, photographs and other social communications on Facebook normalized alcohol consumption among young people The events application was identified as one of the most valued Facebook features. For instance, by sending emails to users through events section, Vodka-Energy not only advertised their parties, they also promoted their sites and alcohol deals
5	Niland et al. (2017)	Young adults aged 18–25 years *n* = 7 (New Zealand)	To examine young adults' interactions with alcohol marketing from within their own social networking practices and to examine participants' meanings and understandings of the ways in which commercial alcohol interests interacted with their own online practices. (Alcohol)	Go-along interviews- participants accessed and navigated through their Facebook accounts and took the researcher on a "tour" showing and elaborating their social networking practices (data screen- capture software to track participants' online navigation and audio-visual recording of the conversation and non-verbal behaviours)	All participants viewed Facebook advertising as the sponsored sidebar ads on their Newsfeed pages, participants did not interpret 'liking' alcohol-related content or alcohol venue page photos and activities as a form of marketing Alcohol online marketing embedded in friendship endorsements and invitations makes the presence of Facebook alcohol marketing obscured since it was simply part of routine online friendship activities. Alcohol marketing on venue pages was not viewed as alcohol marketing but as prompts for friends to drink together Online marketing was explicitly employed by participants as funny user-generated content to share with friends instead of marketing contents
6	Purves et al. (2015)	14–17 years young people	To explore the ways that alcohol marketers engage with consumers	Content analysis by netnographic approaches	Brand communicates their personality through social networking sites. Brand preference

		n = 48 (UK)	on the social media sites (Alcohol)	Focus groups (single sex friendship groups)	indicated the characteristics of young people. For example, males and females may prefer different alcohol brands Participants in the focus group reported seeing large volume of alcohol products marketing on the social networking sites and these were viewed as an inevitable daily content of social networking sites. Participants also reported to be exposed to these marketing contents due to their friends 'liked' or 're-tweeted' posts from alcohol brands
7	Waqa et al. (2015)	Students aged 14–17 years *n* = 30 (Fiji)	To explore Fijian students' view on tobacco and tobacco-related media depictions to gain insight into the drivers of smoking uptake and for potential direction for prevention intervention. (Tobacco)	In-depth interviews	Internet was identified by the young Fijians as an important source of information about tobacco promotion that persuade young people to smoke via repeat screenings and interactive applications and platforms Tobacco related media depictions on the Internet for example celebrity smoking images was viewed by participants as sending the negative messages to young people. Media linked tobacco use to "becoming famous"

Detrimental effects on young people's intention to use the unhealthy commodities were demonstrated in seven out of the nine studies that included intended consumption as outcome measure (Buchanan et al. 2017; Carrotte et al. 2016; Dunlop et al. 2016; Alhabash et al. 2015; Jones & Magee 2011; de Bruijn et al. 2016; Gordon et al. 2011) (Table 2.2). Among the studies that found significant detrimental associations, five studies were on alcohol (Alhabash et al. 2015; Carrotte et al. 2016; de Bruijn et al. 2016; Gordon et al. 2011; Jones & Magee 2011), one on tobacco (Dunlop et al. 2016) and one on energy drinks (Buchanan et al. 2017). Two studies did not find any significant association between digital marketing and consumption intention (Lin et al. 2012; McClure et al. 2016).

Detrimental effects on young people's current use of unhealthy commodities were found in 11 out of the 17 studies that included current consumption as outcome measure (Table 2.2). Among the 11 studies that found significant detrimental association, eight were on alcohol (Carrotte et al. 2016; Critchlow et al. 2016; de Bruijn et al. 2016; Gordon et al. 2011; Hoffman et al. 2014; Jones et al. 2016; Lin et al. 2012; McClure et al. 2016), two were on tobacco (Depue et al. 2015; Singh et al. 2016) and one was on EDNP food (Scully et al. 2012). Four studies found beneficial effects of digital marketing on current use of tobacco (n = 3) (Dunlop et al. 2016; Perez et al. 2012; Salgado et al. 2014) and alcohol (n = 1) (Jones & Magee 2011) products, meaning that exposure to digital marketing was associated with lower current use. Associations in two studies could not be concluded due to the very low reported digital marketing exposure and engagement that led to the exclusion of digital marketing variables in the regression models (MacFadyen et al. 2001; Pinsky et al. 2010).

2.2.4.1 Literature Appraisal

The majority of the studies were cross-sectional studies (*n* = 17) (Carrotte et al. 2016; Critchlow et al. 2016; de Bruijn et al. 2016; Dunlop et al. 2016; Gordon et al. 2011; Hoffman et al. 2014; Jones & Magee 2011; Jones et al. 2016; Lin et al. 2012; MacFadyen et al. 2001; Perez et al. 2012; Pinsky et al. 2010; Reinhold et al. 2017; Salgado et al. 2014; Scully et al. 2012; Singh et al. 2016; Weaver et al. 2016), the remainder were longitudinal studies (*n* = 2) (Depue et al. 2015; McClure et al. 2016), experimental studies, (*n* = 2) (Alhabash et al. 2015; Buchanan et al. 2017) and qualitative studies (*n* = 7) (Atkinson et al. 2017; Gaber & Wright 2014; Lyons et al. 2015; Moraes et al. 2014; Niland et al. 2017; Purves 2015; Waqa et al. 2015). One qualitative study was reported as a short article and it was not possible to obtain further data, so this study was not appraised in this review (Purves 2015).

In the study setup domain for critical appraisal, other than the longitudinal and qualitative studies, all other studies were rated as good other than one experimental study which did not describe randomization and concealment of treatment allocation (Alhabash et al. 2015). Most of the included studies were rated as good in the sample selection domain, however 10 of the cross-sectional studies did not report the participation rate. In the assessment domain, the two experimental studies that objectively measured the study factors (i.e., exposure to digital marketing) were rated as good. The majority of the cross-sectional studies were rated as fair since most of the data were self-reported by the participants. Only one of the two longitudinal studies reported the follow-up rate (62%) (McClure et al. 2016). Most of the qualitative studies were rated as good in the assessment domain by adopting at least two methodologies for data collection. Of note, researchers in two studies used “go-along interviews” and digital navigation software to store the participants’ online activities that included where they navigated through the sites (Lyons et al. 2015; Niland et al. 2017). In the data analysis domain, none of the cross-

sectional studies justified their sample sizes. All studies controlled for potential covariates in their analyses including demographic variables, household and peers' alcohol or tobacco use and psychological aspects such as sensation-seeking.

2.2.5 Discussion

This study systematically reviewed evidence regarding the marketing effects of unhealthy commodities promoted through digital platforms on young people's attitudes and behaviours. The results indicated a link between digital marketing and young people's attitudes towards and intended and current use of a range of unhealthy commodities including alcohol, tobacco and EDNP food or beverages. However, a definitive relationship could not be determined due to the heterogeneity of the study designs, study factors and outcome measures employed by the included studies. Our findings also suggested that the effects of digital marketing vary across the investigated commodities and according to the nature of the exposed digital marketing activities.

Overall, current evidence regarding the effects of digital marketing of unhealthy products highlighted its detrimental impacts, through improving attitudes towards (67% = 2/3 studies), enhancing intention to use (78% = 7/9 studies) and current use of (65% = 11/17 studies) these commodities. These effects seem to be the most consistent among studies on alcohol products, where five out of the seven studies found digital marketing increased intention to drink alcohol, while eight out of 10 studies found digital marketing increased actual alcohol consumption. Our findings are in accordance with the findings from an earlier systematic review that specifically focused on the impacts of digital alcohol marketing, which found that alcohol-related content on the Internet negatively influenced young people's drinking behaviours (Gupta et al. 2016).

The effects of digital marketing were reported to vary between products being advertised. While there was a fairly consistent association between digital alcohol marketing and young people's behaviours, inconsistent findings were found in the tobacco studies. Among the five studies on tobacco products that investigated digital marketing impact on current tobacco use, two of them found non-smokers were more likely to notice tobacco marketing contents on the Internet (Dunlop et al. 2016; Perez et al. 2012), which was completely opposite to the other two tobacco studies that found smokers were more likely to be exposed to digital marketing of tobacco (Depue et al. 2015) and e-cigarettes (Singh et al. 2016). One potential explanation for this could be the perceived images of these products among young people. The tobacco studies that found non-smokers were more likely to have reported seeing digital tobacco marketing were both conducted in Australia, where strong public health controls for tobacco products may have created unappealing images for these products (Dessaix et al. 2016; Freeman 2014) and people who disliked these products (non-smokers) might have paid more attention to the advertisements than current smokers. On the other hand, alcohol brands were marketed using themes of success, fun, masculinity and femininity; these were the images desired by and reported to be socially acceptable among young people to be seen with alcohol products on the SNS (Atkinson et al. 2017; Niland et al. 2017).

Differential impacts from the various digital marketing approaches were also noted. These marketing approaches were broadly categorized into three forms: (i) earned media where the marketing activities were peer endorsed (e.g., likes and comments on SNS by online communities); (ii) owned media where the marketing activities were generated by the company on the channels that it controlled (e.g., posts from company on their brand page); and (iii) paid media activities where the company paid advertisers to create marketing activities (e.g., display advertising) (Stephen & Galak 2012). Significant detrimental effects were demonstrated in two

studies (Alhabash et al. 2015; Jones et al. 2016) from the earned media activities but not the owned or paid media activities of digital marketing. An experimental study in which participants were exposed to Facebook marketing of a specific alcohol brand found that participants' intended alcohol use was associated with the exposure to Facebook status updates (i.e., like, share, comment) (earned media). However, no significant effects on the intended alcohol use were found from the exposure to the online display advertisements on Facebook (paid media) (Alhabash et al. 2015). Another study found participants' engagement with Facebook alcohol marketing (liked, posted, commented or uploaded photos) (earned media) predicted alcohol use but no association was found with exposure to alcohol websites (owned media) (Jones et al. 2016).

Different impacts of the features (interactive and static) of the marketing activities can be explained by the findings from the included qualitative studies. Earned (interactive) media marketing activities, such as online peer networking especially through SNS, may blur the lines between commercial and user-generated content. It was reported in two studies that while participants denied having actively engaged with the digital marketing activities, many of them reported to have had shared amusing product-related contents with their peers on SNS (Lyons et al. 2015; Niland et al. 2017). The influential power of interactive marketing strategies, especially through social context endorsement (friends of endorsers on SNS or electronic word-of-mouth), has been well documented in the marketing research field. An experiment conducted to compare the effectiveness of various Facebook advertisements, including online banner advertisements and advertisements with the names of friends who were also fans on the Facebook page, revealed that the latter worked better in enhancing users' impressions of the product (Li et al. 2014). It has also been revealed by advertising researchers that consumers are more likely to reject advertisements if marketers explicitly show their persuasive motives. However, these messages

became more acceptable if their close acquaintances posted positive comments on the advertised product (Li et al. 2014; Tucker 2012). The seamless peer-to-peer transmission of marketers' messages highlighted the challenges for the public health community to set boundaries and to safeguard young people from promotion of unhealthy products.

2.2.5.1 Strengths and Weaknesses of the Reviewed Studies

The reviewed studies were generally rated between fair and good. The majority of the studies were cross-sectional; the dearth of prospective longitudinal studies and controlled experimental studies limited the ability to make inferences on direction of causality for this research topic. Only one of the two longitudinal studies reported the follow-up participation rate and this study suffered systematic loss to follow-up (more than 20%) that may have introduced potential attrition bias on their results. More longitudinal studies or controlled experimental studies on this research topic appear warranted. The biggest weakness of the included studies was the self-reported method for capturing the exposure variables. The wide variation of the reported exposure and engagement rates discussed earlier could have resulted from the self-reported data.

2.2.5.2 Limitations and Future Research

Several limitations need to be considered when interpreting the results of this review. Firstly, there was a lack of standardization and consistency in measuring digital marketing exposure. The included studies examined marketing impacts of various features of marketing strategies, some more interactive than the others. Additionally, some studies examined mere exposure (if people had seen the promotion), while others examined engagement levels (e.g., likes, shares). The inconsistency of the examined study factors across the included studies may have led to varied study outcomes. Secondly, the majority of the studies included in this review were conducted in developed countries. Research in less economically developed countries is needed due to the

growing unhealthy commodities promotion and the increased technology use in these countries (Lawrence 2011; Poushter 2016). Thirdly, digital marketing is only a small part of companies' promotional efforts for their products. More weight can be added to the literature by comparing the influence of digital marketing to the marketing strategies carried out on different channels. Lastly, there is a possibility of publication bias that studies did not find any signification association may not have been published.

2.2.6 Conclusions

This review concludes that exposure to digital marketing may be associated with young people's attitudes and behaviours for a range of unhealthy commodities. Marketing contents transmitted through young people's social online interactions (earned media) blurs the boundary between user- and marketer-generated contents and appears to have a greater impact than the more explicit online advertisements (owned and paid media). Given the seamless and pervasive nature of the marketing activities on the digital platforms, there is a need for proactive consideration of effective regulation on unhealthy commodities marketed within the online environment. To our knowledge, this is the first review on the influence of this novel form of marketing exposure on young people. This review contributes to the small but growing body of evidence on this research topic by unravelling the complex relationship between marketing exposure and behaviours and identifying areas for future inquiry.

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2.3 Extended literature review

2.3.1 Preface

The literature included in this section has been published after the publication of the systematic review in February 2018 and up to March 2018. The one identified relevant paper had been included in the published systematic review as grey literature and was not previously appraised for quality or discussed in detail (Purves 2015). The following sections present the relevance of the literature to the review topic, quality appraisal of this study, and the consistency with findings from the published systematic review.

2.3.2 Relevance to the review topic

A recent study by Purves and colleageus used qualitative methods to explore the role of alcohol branding in young people's (aged 14–17 years) SNS practices (Purves et al. 2018). The study also explored how this form of alcohol marketing is linked with young people's desired social identities and peer group dynamics. Eight focus groups were conducted with six participants in each group (n=48). Single-sex friendship groups were used in this study based on the understanding that young people, especially children and teenagers, would feel more comfortable in these groupings (Greene & Hill 2005). Participants in the focus groups were also divided according to their socio-economic backgrounds, and age categories-related stage of alcohol drinking, namely 'starter drinkers' (14–15 years) or 'established drinkers' (16–17 years).

2.3.3 Quality appraisal

This study was rated as good in the setup domain. The participants were recruited face-to-face by independent consultants using a detailed questionnaire, where the participants were questioned about their age, gender, socio-economic group, and alcohol consumption within

the last year. However, this study did not report the total number of young people who were approached to be involved in the study or the number of people who refused to participate. In the assessment domain, the data collection method of this study which was, single-sex friendship groups, was clearly justified. Content from alcohol brands' SNS and websites was used to facilitate the discussion. It was reported in the study that the researchers had no prior relationships with the participants, thus implying that any potential biases could be ruled out. Ethical considerations were taken into account by the researchers; information regarding the nature of the study was provided to both the parents and the participants. The study was rated as good in the data analysis domain. An inductive open-ended approach was used to analyse the data. Although analysis of the transcripts was led by one researcher, the emerging themes were discussed among the research team.

2.3.4 Consistency with findings from the published systematic review

Findings from this study aligned with the overall findings reported in the published systematic review. Young people's interactions with alcohol brands on SNS were linked to the way they wanted to be portrayed among their peers. Participants in the focus groups reported that associating themselves with certain alcohol brands was viewed as socially acceptable by their friends but associating with some other brands could be potentially damaging to their images among their peers. Brands that signified maturity and masculinity were more acceptable in comparison to brands that signified femininity and immaturity. The effects of digital marketing on young people did not entirely rely on the actual product, but rather on what the brand signified to this age group. Brands which were symbolically congruent with the young person's desired identity and peers' acceptance, played the most significant role in determining young people's interactions with digital marketing of alcohol.

CHAPTER THREE: METHODOLOGY

3.1 Research purpose

This chapter presents the overall methodology that was adopted in this research. The chapter begins with the restatement of the research purpose, the overarching research approach chosen, the philosophical assumptions of the chosen approach, the research design, the conceptual framework that guided the research, the means of data collection and analysis used in the three included studies, and finally, the ethical considerations of each study.

As stated in the general introduction chapter (Chapter 1), the overarching aim of this research was to explore the influences of digital marketing on young adults' unhealthy food-related attitudes and behaviours, using a relatively new and unhealthy popular beverage product category – energy drinks – as an exemplar. As highlighted in the literature review chapter (Chapter 2), previous studies on the effects of digital marketing have generally suggested that this form of marketing had negative impacts on product-related attitudes and behaviours. However the majority of these studies were on other unhealthy commodities, such as alcohol and tobacco. Very few studies have examined such effects on food or non-alcoholic beverages.

This research explored the influences of digital marketing through a number of studies. First, an exploration was undertaken of the nature and extent of promotional activities by energy drink brands within the online environment that may appeal to young adults. A second study investigated whether this form of marketing exerted impacts on young people and, specifically, the ways in which this marketing influenced young adults' attitudes and behaviours towards energy drinks. Third, the relative impacts on young adults' energy drink

use as a result of this form of marketing was compared to other forms of marketing activities. A social psychology theoretical framework was used to frame the examination of factors that may mediate these impacts.

3.2 Research approach

To achieve the purpose of this research, a mixed methods approach was adopted. Different research approaches were identified through the literature review reported in Chapter 2. For some aspects of this research topic quantitative methods were deemed more appropriate, for example, to explore the levels of marketing exposure and any relationship between exposure and consumption (de Bruijn et al. 2016; Carrotte et al. 2016). Some other aspects of the research were more appropriately explored using qualitative methods, for example, to provide insights into young people's perspectives and experiences including their social networking practices (Atkinson et al. 2017; Lyons et al. 2015).

Mixed methods research has been acknowledged as a useful approach for understanding the complex issues that confront public health discipline (Kaur 2016). This discipline originated from the field of epidemiology, which was fundamentally a quantitative discipline that defined health problems as well as determined the causes of these problems (Kaur 2016; Division of Health Care Services 1988). However, by the end of 20th century, the public health discipline increasingly acknowledged the social determinants of health and this influenced how research was conducted (Kaur 2016; Von dem Knesebeck 2015). Contemporary public health research encompasses understanding of social and environmental factors that influence health behaviours, delivering services to encourage better health decisions, and providing evidence to inform policy and practices (Division of Health Care Services 1988). Qualitative approaches that provide more in-depth comprehension of the

complex social reality were adopted by public health researchers, in combination with quantitative methods, in order to achieve a broader and deeper understanding of health issues (Nhan 2012; Upadhyaya 2015; Andrew & Halcomb 2006).

Mixed methods research has commonly been used in the social sciences. It is based on the idea of achieving heightened understanding of a theory or phenomenon through using multiple and different methods or triangulation between different methods (Turner et al. 2017). The importance of methods triangulation was pointed out by McGrath (1982) that 'all research strategies and methods are seriously flawed' (p.70). Through triangulation, the potential limitations of each method may be overcome by other methods and the different methods are viewed as complementary rather than in competition (Jick 1979).

3.3 Philosophical assumptions

While the philosophical worldview of adopting a mixed methods approach is not as distinctly defined or universally accepted as the 'traditional' positivism (realism) or constructivism (relativism), Creswell and Clark (2011) positioned pragmatism as an empowerment or issue oriented 'participatory' worldview. The ontological position of this 'participatory' worldview is neither realism nor relativism, since the two polarised philosophies of science hold some irreconcilable perspectives concerning the nature of research (Maxwell & Mittapalli 2010). This 'participatory' worldview can be considered as an 'either-or' perspective. Danermark et al. (2002) argued that this 'either-or' perspective can be turned into a 'both-and' perspective, which can form a new standpoint – *Critical Realism*.

Critical realism concurs with the idea of relativism that all knowledge is socially produced. It also agrees with the criticism of realism that the ideal of science can only be achieved

through neutral empirical observations (Danermark et al. 2002). From the critical realist perspective,

> 'The method of obtaining knowledge cannot be reduced to observation of events. Reality is not a series of events, where one thing follows on another with empirically observable regularity… To be able to discover meanings, relations and consistency, to be able to obtain knowledge of social structures and transfactual conditions, abduction and retroduction are necessary' (Danermark et al. 2002, p. 203).

Critical realism has been considered as most relevant for this thesis as it provided appropriate ontological assumptions to address the research aim.

Pragmatism provides a philosophical basis for the use of mixed methods approach in this research. The notion of pragmatism is derived from Charles Sanders Pierce who stated that the rule to get a clearness of comprehension is to:

> 'consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object' (Peirce 1878 , p. 293).

The epistemology of this thesis is based on a pragmatic perspective. The pragmatic method and system of philosophy takes an explicitly outcome-oriented inquiry, which offers researchers the opportunity of mixing various research methodologies that assist them to better answer their research questions, instead of having to choose the more common quantitative or qualitative approaches (Johnson & Onwuegbuzie 2004). Pragmatism

advocates that instead of focusing on the methods, the researchers should emphasise the anticipated practical bearings of the research and then adopt appropriate approaches to uncover the underlying research problem (Creswell & Clark 2011). Table 3.1 summarises the framework of this research.

Table 3.1: Paradigm of the research

		Relevance to this research
Paradigm	'Participatory' worldview	The complexity of the public health issues (food environment affects attitudes and behaviours) being explored in this research cannot be sufficiently explained through the traditional positivism or constructivism worldviews. The emerging 'participatory' worldview, which incorporates both the positivism and constructivism viewpoints, stimulates new patterns of thoughts and beliefs that lead to a more thorough understanding of the research questions proposed in this thesis, including whether digital marketing is associated with food-related attitudes and behaviours (positivism) and how digital marketing exerts effects (constructivism).
Ontology	Critical realism	From a critical realism standpoint, to obtain a comprehensive knowledge about the impacts of food environment on attitudes and behaviours, both empirical experiments (i.e. exposure experiment) (realism) and observation of social practices (i.e. semi-structured interviews) (relativism) are required in this research.
Epistemology	Pragmatism	Through a pragmatic perspective, this research follows an outcome-oriented approach, where the methodologies were selected based on the proposed research questions. This thesis inquired the nature and scope of digital marketing as well as the relational effects of digital marketing on attitudes and behaviours. Thus, more than one method is required to provide a complete understanding of the investigated issues.
Methodology	Mixed methods approach	The triangulation of quantitative and qualitative methods overcomes the potential limitations of each method. Qualitative methods are used to describe the nature of

		digital marketing and explain why attitudes and behaviours are influenced by this kind of marketing strategy by exploring the social practices of participants. On the other hand, quantitative methods are used to confirm or revoke the effects of digital marketing on attitudes and behaviours through an empirical experiment.
Methods	Thematic content analysis Randomised controlled trial Semi-structured interview Online survey	Study 1 described the nature and extent of digital marketing. Study 2 investigated if digital marketing exerts effects on young adults' food-related attitudes and behaviours through a randomised controlled trial. The findings were supplemented by a semi-structured interview to confirm or revoke the changes in attitudes and behaviours after the experiment. The participants' views were also explored in the interviews. Study 3 utilised online survey data to compare the relative strength of digital marketing to other forms of marketing activities. The mediating effects of components from a social psychology theory in the relationship between digital marketing and attitudes and behaviours were tested.

3.4 Research design

In this research, quantitative and qualitative methods were brought together to answer the research question through a linking process – convergent triangulation. This is one of the most utilised mixed methods strategies. The researchers aim to demonstrate valid results by finding agreement across findings from different research methods (Creswell 2009; Turner et al. 2017). In convergent triangulation, both quantitative and qualitative data are collected simultaneously but analysed separately; the results are compared to see if the findings support or oppose each other (Creswell 2009; Kaur 2016). The key assumption of convergent triangulation is that the qualitative and quantitative data provide different insights for researchers to address the research question (Creswell 2009).

Both quantitative and qualitative methods serve different purposes in triangulation; the quantitative data confirm or revoke the precision and reproducibility of the findings while the qualitative data clarify and enrich the findings (Jick 1979; Kaur 2016). In this research, both quantitative and qualitative research methods address the research question. The quantitative data were collected to describe the scope and effects of digital marketing on energy drink use, while the qualitative data were important to reveal what and how digital marketing influenced young adults. The results were brought together at the end for overall interpretation.

Consistent with convergent triangulation, the data collection and analyses for the quantitative and qualitative studies in this research were conducted both across different stages and in parallel (Study 2, see Section 3.6). A theory testing component was also included in this research. An overall outline of the mixed methods design of this research and the points of data integration are shown in Figure 3.1.

In convergent triangulation, the collection and analysis of qualitative and quantitative data are commonly conducted during a similar timeframe (Fetters et al. 2013); although, mixing the quantitative and qualitative approaches across different stages of the research has also been used in previous studies (Johnson & Christensen 2008; Johnson & Onwuegbuzie 2004). For the more common variation of convergent triangulation, where the data collection of both quantitative and qualitative approaches occurs in parallel, the integration of two forms of data begins subsequently proceeding or at the completion of data collection (Fetters et al. 2013). During the interpretation phase, the two forms of data are summarised and interpreted to ascertain in what ways the data concur or deviate from each other in order to obtain a complete understanding of the research issue (Creswell & Clark 2011). In this thesis, the

quantitative and qualitative data were integrated and interpreted in parallel as well as at the completion of the research.

Convergent triangulation also serves the purpose of developing or testing theories (Turner et al. 2017). It is possible that through triangulation, the researchers uncover deviant findings or viewpoints that do not fit in a particular theory (Jick 1979). This is not necessarily an issue; instead, the divergent results may lead to a more enriched explanation of the research issue and new theories or a combination of diverse theories may be used to comprehend the research findings (Jick 1979).

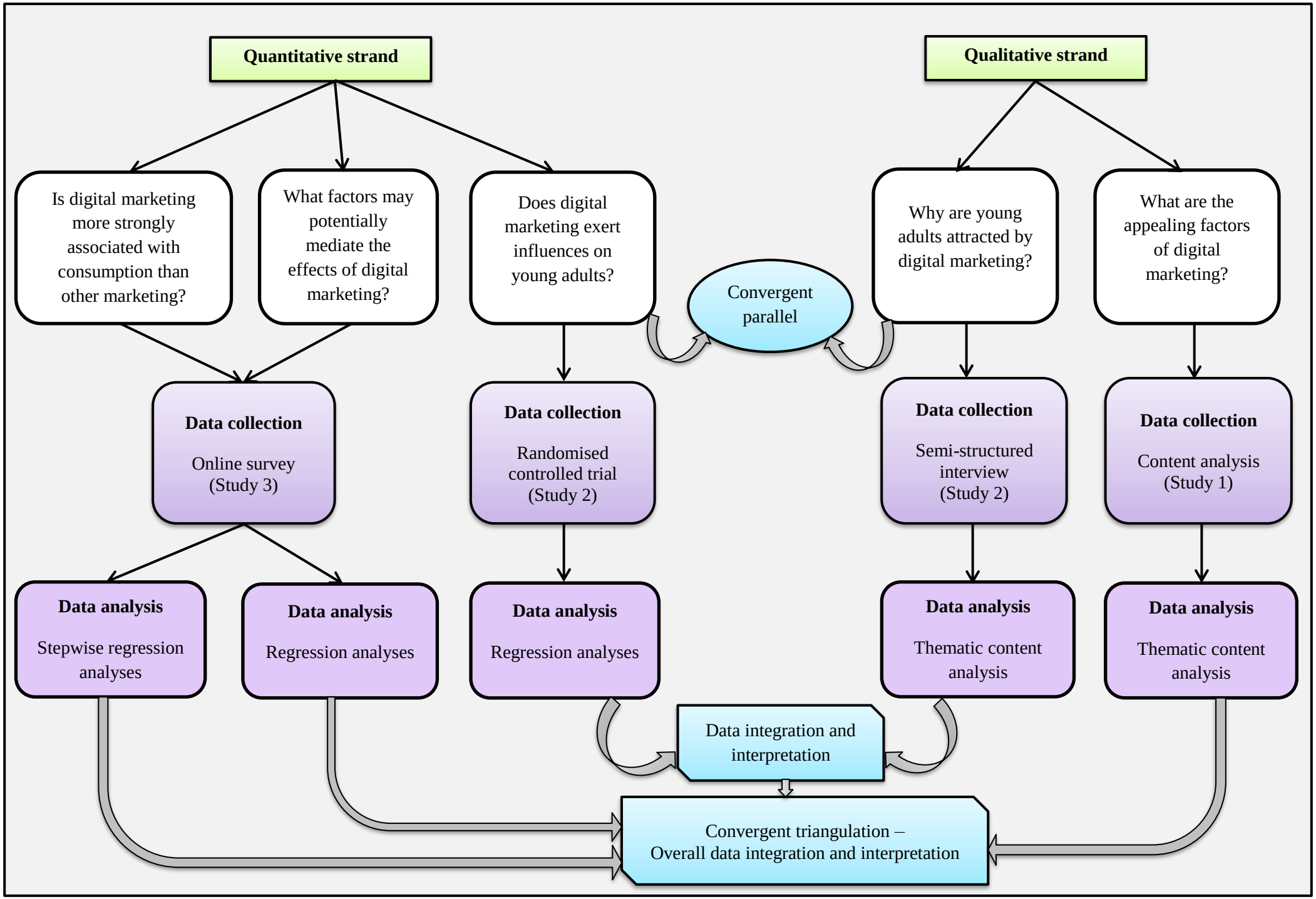

Figure 3.1: Mixed methods design of the research

3.5 Conceptual Framework

The conceptual framework for this research was derived from the components of three social psychology theories: Theory of Planned Behaviour (TPB), Elaboration Likelihood Model (ELM), and Social Identity Theory (SIT). Each theory addressed different aspects of the research question: (i) TPB guided the exploration of the influences of digital marketing on food-related attitudes and behaviours; (ii) ELM provided a framework to analyse how individuals processed the digital forms of marketing messages; and (iii) SIT provided a framework to inform the analysis of the appeal factors of digital marketing strategies on young adults. Figure 3.2 illustrates the conceptual framework of this thesis as informed by the three theories and the hypothesised inter-relationships between the examined key variables.

3.5.1 Theory of Planned Behaviour

The TPB guided the central focus of this research, which was to examine if digital marketing influenced food-related attitudes and behaviours. In this study, as detailed in Chapter 6, it was hypothesised that digital marketing – an external environmental factor – exerted influences on the individual's salient beliefs before any behaviour change occurred, and these salient beliefs could potentially mediate the effects of the exposure variable on the outcome behaviours.

The TPB was developed by Ajzen in the 1980s and is one of the most well-known social psychology theories that has been used to predict and understand people's intentions to engage in certain activities (Ajzen 1991). The TPB has been consistently applied in various studies to explain health behaviours such as smoking and alcohol use (Glanz et al. 2008). This theory proposed that three intra- and inter-personal factors determined the likelihood of an individual's intention to perform a behaviour: *attitude*, whether an individual is in favour

of performing a behaviour; *subjective norm,* the individual's perception of social pressure to perform the behaviour or not; and *perceived behavioural control (PBC)*, the individual's perceived ease or difficulty in performing the behaviour (Ajzen 1991).

3.5.2 Elaboration Likelihood Model of persuasion

While the TPB may assist in the explanation of the effects of digital marketing on intra- and inter-personal factors which may subsequently lead to behaviours, the Elaboration Likelihood Model (ELM) of persuasion contributes to the Conceptual Framework of this research, by describing the thinking processes that might occur when an individual is exposed to the persuasive messages of digital marketing. The ELM was proposed by Cacioppo & Petty (1984) and was particularly relevant to examine the impacts of marketing messages on consumers' thinking processes. It has been adopted in previous studies, which have aimed to increase the understanding of advertising's effects on food-related practices (Kim et al. 2016; Moore & Rideout 2007).

This framework suggests that the message recipients were neither completely cogitative nor mindless when dealing with the persuasive messages. Instead, their motivation and ability to evaluate the persuasive appeals were influenced by different levels of information processing, and were determined by various factors. The framework proposed two routes of information processing that would lead to changes in attitudes and behaviour: a *central* route through which recipients gave thoughtful evaluation of the true merits of persuasive messages; and a *peripheral* route through which recipients processed the persuasive messages heuristically without much effortful thinking (Cacioppo & Petty 1984). The factors that influenced the persuasive messages to be processed through central or peripheral routes are called central and peripheral cues. With respect to food marketing, examples of central cues may include

nutrition information (Harris et al. 2009), taste and flavour of the products (Bell et al. 2009). Common examples of peripheral cues are emotional appeals such as fun, happiness and excitement, which the marketers establish an association with the food products (Roberts & Pettigrew 2007; Wicks et al. 2009).

The ELM was explicitly used to explain the qualitative findings from Study 2 in this research (Chapter 5).

3.5.3 Social Identity Theory

The Social Identity Theory (SIT) posits that people strive to achieve a positive social identity as a member of a certain group. It is particularly relevant to one of the research questions in this thesis; that is, the understanding of what types of marketing strategies appeals to young adults within the online environment. Tajfel & Turner (2003) argued that individuals' social identities are associated with the emotional significance attached to the membership of a social group. Such emotional attachment strengthens the individual's intention to purchase or use a product or service (Tajfel & Turner 2003). This theory has been widely used in various research fields including online consumer psychology, as well as studies to understand young people's behaviours (Scott-Parker et al. 2009; Teng 2017). The SIT suggests that the development of social identity peaked when individuals reached adolescence and young adulthood due to the eagerness to seek approval from their peers at this life stage (Tajfel & Turner 2003). Given that young adults aged 18 to 24 years were the main focus of this research, the SIT offered potential benefits in enhancing the understanding of strategies that food marketers utilised on the Internet to 'attract' this age group.

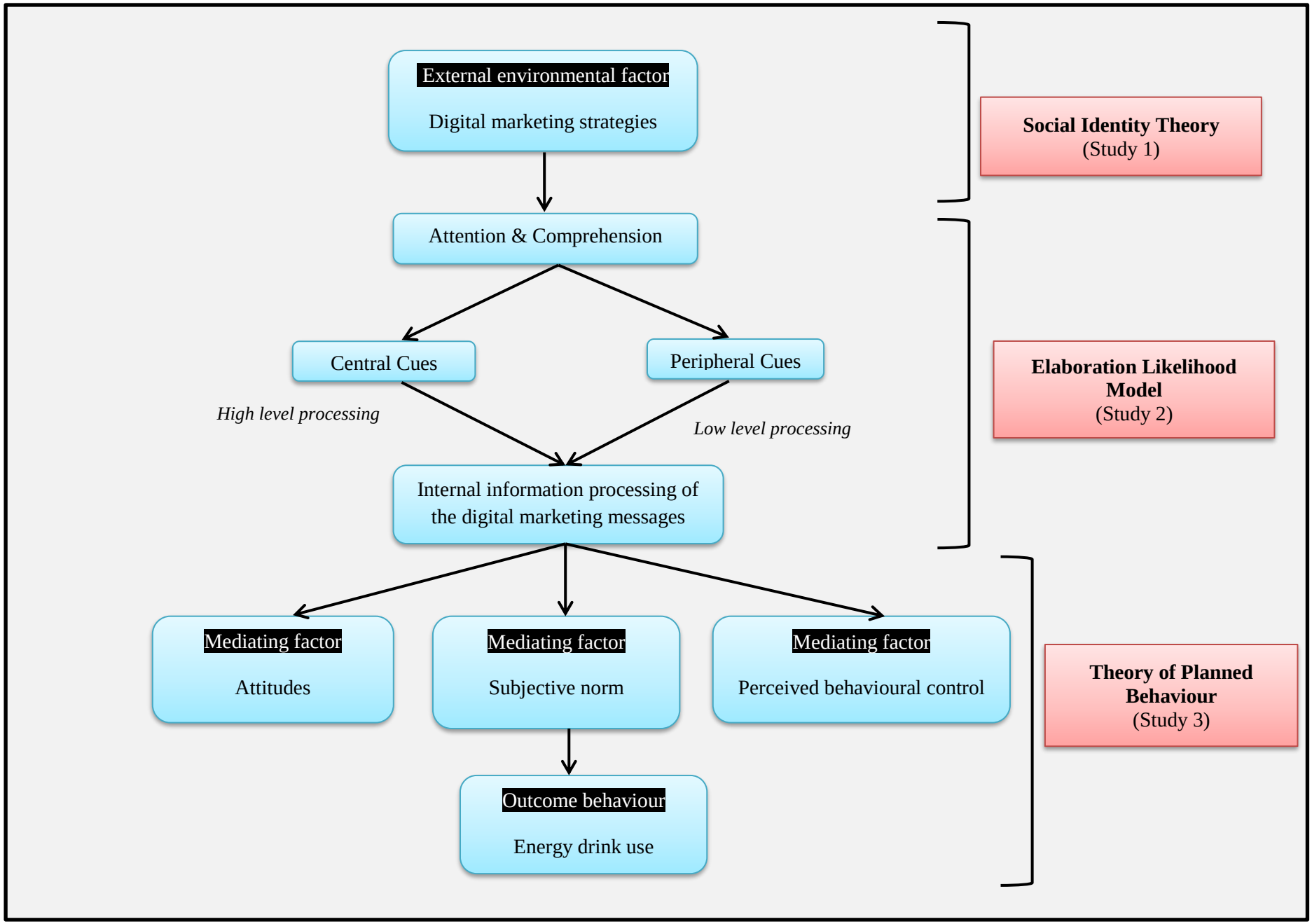

Figure 3.2: Conceptual framework of the research

3.6 Research methods

With respect to the theory attributes, in the first part of the research, content analyses of the promotional strategies of energy drinks across multiple digital platforms were used to develop an understanding of the strategies that may appeal to young adults. In the second part of the research, the randomised-controlled trial contributed to testing the causal link between digital marketing and energy drink use, while the semi-structured interviews contributed to understanding why the young adults were or were not influenced by these digital marketing strategies. Finally, in the third part of the research, statistical analyses of cross-sectional data from an online survey contributed to the examination of whether digital marketing exerted more or less impact on young adults' energy drink use than other forms of marketing strategies. This analysis also tested whether the TPB constructs mediated the effects of digital marketing on energy drink use. Thus, all methods contributed to the exploration of digital marketing in different ways for different parts of the conceptual framework. Each method is described in the following sections.

3.6.1 Study one: Thematic content analysis

This part of the research aimed to reveal the nature and extent of the promotional strategies that food marketers used to promote energy drinks on the Internet.

3.6.1.1 Study design

This study analysed the appeal strategies utilised by energy drink brands on digital media platforms that are popular among young adults. Marketing contents on the three most popular SNS – Facebook, Twitter, and YouTube (Winpenny et al. 2013) – were analysed, as well as the brands' official websites and advergames (i.e. brands or products embedded within online games) identified on these sites for their content.

3.6.1.2 Coding tool

A coding tool was developed based on the literature on tobacco and alcohol marketing tactics, studies on content analyses of messages on social media sites, as well as studies that analysed food company advergames (Ashley & Tuten 2015; Liang et al. 2015; Moore & Rideout 2007; Lee et al. 2009).

3.6.1.3 Sample selection

Common energy drink brands in Australia were identified by visiting the two largest supermarket chains – Coles, Woolworths – the local fuel stations, bottle shops and convenience stores in the Illawarra region of New South Wales, Australia in June 2015. The identified energy drink brands were verified according to the Australia New Zealand Food Standards Code's energy drink classification – that is, no less than 145mg/L and no more than 320 mg/L caffeine content (Food Regulation Standing Committee Caffeine Working Group 2013). Textual and visual content on the SNS of the identified energy drink brands were screenshotted over a one-month period, while the textual and visual content on the official websites and advergames of the identified energy drink brands were screenshotted over two days.

3.6.1.4 Data analysis

Screenshots of the posts and webpages were taken as a static sample for validity check. The textual and visual elements extracted from the posts were coded. Consistency of coding of 10% of the sample was assessed by a second independent coder. A thematic content analysis of messages contained in the posts was conducted. An inductive approach was used to identify the frequently occurring themes and categories. Codes underlying the broad themes were developed before they were further categorised into more specific themes.

3.6.2 Study two: Exposure experiment

This part of the research aimed to examine if exposure to digital marketing exerted influences on young adults' energy drink attitudes and use, and to investigate what young adults may find appealing about this form of marketing.

3.6.2.1 Study design

A mixed methods approach was adopted in this part of the research. This study adopted a pre-test post-test randomised controlled trial followed by post-test semi-structured interviews. A pilot study (N=16) was conducted to pre-test the research instrument and to calculate the required sample size. A sample size of 60 was required to achieve the statistical power using G-Power statistical analysis software with the following input parameters: effect size= .8, α= .05, and between-groups comparison effect size of attitude change towards energy drinks observed in the pilot study (d= .52).

3.6.2.2 Participants

Young adults aged 18 to 24 years were recruited in the Illawarra region of New South Wales, Australia, between July 2015 and March 2016. The study was promoted as a study about Internet usage and food consumption. Information about energy drinks was intentionally removed from any advertising materials in order to recruit both the energy drink users and non-users. Any young adults meeting the age criteria and knowing how to use the Internet were eligible. The study was promoted through handing out flyers (Appendix L) in universities and community colleges, at bus-stops, community centres, local sports clubs, and a local theme park, and through social media advertising and snowball sampling.

3.6.2.3 Materials

3.6.2.3.1 Exposure experiment

The materials used in the experiment were websites and social media sites of two popular energy drink brands: *Red Bull* and *V Energy*. These two brands were selected based on their popularity and their distinctive marketing strategies as informed in Study 1 (thematic content analysis). The participants were told to browse the sites for eight minutes – four minutes on each brand. The control participants were exposed to the websites and social media sites of two relatively healthy nut bar brands.

3.6.2.3.2 Pre- and post-test surveys

The participants self-completed the surveys at pre- and post-test (5–10 minutes each) (Appendices N–P). Items in the surveys included participants' attitudes towards and purchase intention of, the two examined energy drink brands and energy drink products in general. Nut bars, soft drinks, and muesli bar brands were included in the pre-test survey as distractors. The pre-test survey also asked questions regarding the participants' demographic details and Internet usage.

3.6.2.3.3 Post-test semi-structured interview

A semi-structured interview was conducted after the experiment to capture qualitative data on the participants' perceptions of the exposed materials, energy drink brands, and whether the experiment influenced their views about energy drink products. The interview guide (Appendices P–Q) was developed by the student researcher in consultation with the supervisory team and based on the findings from Study 1, as well as previous literature about marketing effects on food-related behaviours (Hernandez & Chapa 2010). The interviews took approximately 10 minutes to complete and were audio-recorded.

3.6.2.4 Procedures

Randomisation of participants was performed after the potential participants booked in for the study sessions. The researcher randomly picked up sealed envelopes that contained either control or experimental surveys. In the beginning of the study session, before the experiment, the participants were asked to select one food and drink item from a poster displaying a range of food and beverage products' images. The experiment was conducted at venues at the participants' convenience, for instance, a meeting room, a park, and in cafes. The participants completed the pre-test survey before they were asked to browse the two energy drink brands' websites and social media sites. They were allowed to browse freely on the sites (i.e. webpages of photos, videos, company information, advergames, and recipes) using a laptop, as long as they stayed within the two selected energy drink brands' sites. After the experiment, they were asked to select one food and drink item from the poster again before they filled in the post-test survey and participated in the semi-structured interview. The experiment group participants were given a Fact Sheet about the negative health impacts of energy drink consumption after the completion of the study.

3.6.2.5 Data analysis

For the quantitative data, statistical analysis was undertaken using the Statistical Package for Social Sciences (SPSS) for Windows, version 21. Independent sample t-tests or Mann-Whitney U tests were used to identify the changes in attitudes and purchase intentions of energy drinks collected through the pre-test and post-test surveys. The Fisher-exact test was used to identify the changes in energy drinks consumption intention before and after the experiment. The level of significance was set at P values < 0.05.

The qualitative data were content analysed to elicit common themes that arose from participants' perceptions of the exposed online materials and energy drink products. Content analysis followed a staged process: (i) open coding based on the field notes taken by the student researcher during the interviews, which were re-read several times; and (ii) grouping and categorising the related contents before they were grouped into higher categories.

3.6.3 Study three: Online survey

This part of the research aimed to examine if digital marketing exerted more negative impacts on young adults' energy drink use than other forms of marketing activities. The mediating effects of the three TPB constructs – attitude, subjective norm, and PBC – in the relationship between digital marketing and energy drink use were also tested in this study.

3.6.3.1 Participants

Young adults aged 18 to 24 years were recruited from the Illawarra region of New South Wales, Australia between February and October 2016. The study was advertised in lectures and on students' online learning platforms at one university in the region, and through flyers (Appendix R) at the local community college, library, youth centre, community centre, sports clubs, and shopping centres, and via paid targeted advertisements on Facebook. A sample size calculation was attempted to estimate the number of required survey respondents in order to reach sufficient statistical power. Assuming a 100% response rate, the minimum sample size required was 379, based on a total population of 27,070 aged 18–24 years living in the Illawarra (ABS 2011), margin error of 5% and a confidence level of 95%.

3.6.3.2 Materials

A 44-item survey was set up on the Survey Monkey (Appendix S). The survey was pilot tested (N=15) and took approximately 10 minutes to complete. The survey items consisted of basic demographic questions (i.e. age, gender, work and education statuses, and residential postal code); exposure to, and engagement with, digital and other forms of marketing activities of energy drinks; attitudes towards, the subjective norm about, and PBC over energy drink use; the significant others' (parents/partner/friends/siblings) acceptability of energy drink use; and the participants' energy drink use status. The survey items were derived from literature regarding marketing effects on food or beverage consumption (Gordon et al. 2011; Scully et al. 2012).

3.6.3.3 Data analysis

Data analyses were conducted using SPSS version 21. The energy drink use status data were categorised into 'users' vs 'non-users'. Independent sample t-tests and Pearson chi-square tests were conducted to compare the differences between energy drink users and non-users regarding their age, gender, student and work statuses, exposure to, and engagement with digital and other forms of marketing activities, and their attitudes, subjective norm, and PBC about energy drink use.

The stepwise regression model was conducted to examine the relative impact on energy drink brands' use of digital marketing as compared to other forms of marketing activities. The regression analyses were performed to examine if attitudes, subjective norm, and PBC mediate the effects of digital marketing on energy drink use.

3.7 Ethical considerations

A number of ethical considerations were raised in this research including the participants' informed consent, confidentiality and anonymity, as well as their voluntary participation in this research. Two parts of the research (Study 2: Exposure experiment and Study 3: Online survey) required ethics approval. Both studies received approval from the University of Wollongong Human Research Ethics Committee; the ethics approval numbers were HE15-280 (Study 2) and HE16-038 (Study 3). Copies of the ethics approvals are in Appendices T–U.

This research focused on investigating the participants' views on online marketing materials and their energy drink use. Although the participants were asked to provide some basic demographic details, it was not anticipated that any discomfort or disadvantage would arise from participating in the research. The participants were fully informed through participant information sheets about the nature of the research, what they were expected to do in the studies, and the potential benefits and risks of the study. In Study 2, hard copy participant information sheets were provided to the participants and written consents were obtained before the experiment. In Study 3, a participant information sheet was set up as the online survey opening page. The participants indicated their permission for the use of their data by continuing to the second page of the survey. They were assured through the participant information sheet that their participation was voluntary and they were free to refuse to participate or withdraw from the study at any time point of the research. The participant information sheet from Study 2 is included in Appendix V.

Efforts were made to ensure the anonymity and confidentiality of the participants. In Study 2, the participants remained anonymous through the use of code numbers being assigned to each

participant, to enable comparisons between their responses before and after the experiment. The code list was kept separately in a secure location. No identifying details of the participants were recorded throughout the study. In Study 3, no identifying details were collected in the survey. For those participants who wished to be entered into a lucky draw, their contact details were recorded through an optional question set up on a separate webpage. All data were accessible only to the researchers to protect the confidentiality of the participants.

3.8 Summary

This chapter outlined the research approach adopted in this thesis and the philosophical assumptions underlying this approach. Through an emerging participatory worldview, this research incorporated the viewpoints of both positivism and constructivism. The ontological stance of this research – critical realism – underlined the importance of having both an empirical experiment and a social observation to gain clearness of comprehension in the research. The epistemology of this research – pragmatism – advocated outcome-oriented inquiry, which was reflected in the use of a mixed methods approach to address the proposed research questions. A conceptual framework based on three social psychology theories – TPB, ELM, and SIT – illustrated the concepts of this research. The research methods adopted in the three studies of this research included a combination of quantitative and qualitative tools – thematic content analysis, randomised controlled trial, semi-structured interview, and online survey. All the quantitative and qualitative data were integrated, analysed and interpreted at the end of the research. Ethical issues including participants' informed consent, confidentiality and anonymity, and voluntary participation were taken into account when conducting this research. The next chapter will present part one of the research – the content analysis study.

CHAPTER 4: WHAT ARE THE DIGITAL MARKETING STRATEGIES?

4.1 Preface

Review of the available literature (Chapter 2) identified a range of research that had investigated the influences of digital marketing of unhealthy commodities on young people's attitudes, and on the intended and actual consumption of these products. The majority of the research had investigated digital marketing in relation to alcohol or tobacco products; research on the impacts of digital marketing of food and non-alcoholic products was scant. A few qualitative studies provided insights into how digital marketing may exert effects on young people, but empirical evidence on how this form of marketing appealed to young people was limited. Public health researchers need to explore the appeal factors of digital marketing for young people in order to establish strategies to counter their potential negative effects.

This chapter explores the first research question: What promotional strategies are used by energy drink marketers to target young people on digital platforms, and to what extent? This exploration comprises three parts. First, the nature of digital marketing and how this form of marketing is anticipated to work in product promotion are described. This is followed by consideration of the relevance of the Social Identity Theory (SIT), with particular attention directed to product promotions aimed towards young people who use digital platforms.

The third part of the chapter reports the findings of a thematic content analysis of energy drinks marketing content on digital platforms. In this study, brand-generated textual and visual marketing content of nine common energy drink brands in the Australian market was identified on three popular SNS – Facebook, Twitter and YouTube, as well as their official

websites and advergames. Four key themes were derived from the textual and visual data. The final section of the chapter (Section 4.4) comprises a brief report that has been accepted for publication by the Australian and New Zealand Journal of Public Health and is currently under review.

Buchanan, L, Yeatman, H, Kelly, B & Kariippanon, K 2018, 'A thematic content analysis of how marketers promote unhealthy beverages on the digital platforms: Energy drinks as an example', *Australian and New Zealand Journal of Public Health*, accepted on 28 August 2018.

Authors' contribution: L. Buchanan was responsible for study design, data collection, data analysis and interpretation, and writing the original draft of the manuscript. H. Yeatman and B. Kelly contributed to the conception of the study, analysis and interpretation of the results, and review and editing of the manuscript. K. Kariippanon contributed to the review and editing of the manuscript.

4.2 What is digital marketing and how is it assumed to work?

It is essential to clarify the term 'digital marketing' in this research. Kelly et al. (2015) described it as any promotional activities transmitted through digital technologies, including SNS, websites, blogs, advergames (i.e. branded products or advertisements embedded within interactive games), mobile devices and text messaging.

Having described digital marketing, it is important to explore how this form of marketing is assumed to work. Montgomery et al. (2011) summarised six characteristics of digital marketing to illuminate the way in which it is assumed to have effects on young people, namely: ubiquitous connectivity, user-generated content, personalisation, immersive environment, social graph, and engagement. A brief description of each of these mechanisms is now provided.

The *ubiquitous nature of digital media* allows marketers to target their products at consumers, especially young people, who now have constant connectivity to the Internet, often through multiple devices (e.g. computers and mobile phones) in real time with analytics and metrics for measuring the reach and penetration of their messages.

Through the behavioural targeting function of digital media, marketers have created *personalised marketing appeals* based on the consumers' characteristics, their browsing history, and previous purchasing preferences. This marketing strategy has been found to be much more effective than the traditional media marketing (Montgomery & Chester 2009).

The *immersive online environment* where the consumers were surrounded by realistic images and sounds served to create a sense of presence in the virtual environment, making digital marketing much more interesting for the users and online interactions more realistic.

Digital marketing transformed the consumers from passive message recipients to active co-producers or distributors/marketers, by allowing the *consumers to generate content about the product*. For instance, they may comment on the products through SNS and use hashtags to promote the products to other online followers.

Additionally, consumers could *engage with the brands* – for instance, subscribers of a brand's Facebook page were tagged into all the brands' update activity. Digital media allowed marketers to tap into the consumers' online social relationships. Marketing messages were easily distributed through peer interactions, for example, through eWOM or SNS, and the users were exposed to a marketing message due to their friends' engagement with the brand (Montgomery et al. 2011).

4.3 The relevance of Social Identity Theory

The relationship between self-identity and imagery was an important related area of interest in this study. Marketers have suggested that the key to forming a strong relationship with the consumer depended on how consumers associated or identified themselves with the brands to satisfy one or more of their self-definitional needs (Bhattacharya & Sen 2003). Evidence has suggested that marketers deliberately seek to build and exploit this brand relationship through digital media (Montgomery et al. 2011). For instance, one study found that young people attempted to improve their online identities through associating themselves with the alcohol brands on social media (Lyons et al. 2015). Drawing on this concept of consumer-brand

imagery, this study adopted SIT (Tajfel & Turner 1986) to delineate the potential effects of digital marketing on young people.

It is important to examine the online materials created by the energy drink marketers to confirm whether the self-identity and imagery components were used as promotional strategies by the unhealthy beverage industry. The capability of digital marketing to develop social identity among consumers may make this form of marketing more effective in influencing young people than the traditional marketing.

The SIT proposed that an individual's self-identity came from belonging to a group and the stronger the sense of belonging, the more likely that individual would behave in a way that corresponded with the values and emotional significance attached to that particular group (Brown 2000; Tajfel & Turner 1986). The positive social identity that an individual strives for was mainly derived from favourable comparisons between and/or within groups (Brown 2000). The virtual environments within the online platforms offered a unique forum whereby young people developed their self-identity, explored their peer relationships and formed online communities (Montgomery & Chester 2009). This unique relationship between young people and digital media has drawn the attention of marketers, with evidence showing that marketers developed strategies tailored specifically to young people's psychological needs and exploited this to build strong emotional connections between young users and their brands (Lorinc 2015; Montgomery & Chester 2009).

4.4 The accepted manuscript- A thematic content analysis of how marketers promote unhealthy beverages on the digital platforms: energy drinks as an example

4.4.1 Abstract

Objective: This study aimed to explore the nature and extent of, and level of user-engagement with, appealing strategies used by the food industry on digital platforms to promote energy drinks.

Methods: Thematic content analysis was employed to code the textual and visual elements of the data that were extracted from nine energy drinks' online media pages, including posts on Facebook, YouTube, Twitter, websites and advergames.

Results: Four main themes were derived from the 624 textual and visual elements of energy drink brands' digital marketing content, including online social connectivity, desired social identity, enhancement of performance and enhancement of mood.

Conclusions: Energy drinks were popular on digital platforms, as evidenced by the large volume of user-engagement (e.g. 'likes' and 'comments') especially on social networking sites. Energy drink brands appear to target young people, given that the marketing appeals are likely attuned with young people's desires or aspirations.

Implications for Public Health: To counter the effects of digital marketing on young people's health, regulations are needed to safeguard adolescents and young adults, as well as younger children, from the marketing of unhealthy products; and consideration be given to include all forms of marketing communication platforms including the Internet

Keywords: digital marketing; energy drinks; young people; beverage; food; advertising

4.4.2 Background

High exposure to marketing of unhealthy food and beverages has been identified as one of the key contributors of global overweight and obesity (World Health Organization 2005). Research attention has primarily focused on the effect of this marketing on young children, particularly through TV advertising (Kelly et al. 2015). Less research evidence is available on such effects through digital media, and on adolescents or young adults, hereby collectively referred to as "young people". There is evidence that marketing campaigns are increasingly moving online (Schultz 2013). Given that young people spend much of their time on the Internet (ABS 2016), and are reported to have the poorest diets and gain weight faster than the other age groups (Allman-Farinelli et al. 2008), it is important to explore how marketers appeal to young people on digital platforms, as young people spend much of their time on the Internet (Australian Bureau of Statistics 2016), are reported to have the poorest diets and gain weight faster than other age groups (Allman-Farinelli et al. 2008). Energy drinks are a relatively new non-alcoholic product category that is widely promoted on the Internet and is popular among young people (Rudd Center for Food Policy & Obesity 2011). These drinks were selected as an example in this study. Energy drinks have been marketed to improve alertness and stamina (Fogger & McGuinness 2011), however their claimed functionality remains inconclusive. Furthermore, ingredients of these drinks such as caffeine and sugar have been linked to health issues such as anxiety and adverse cardiovascular events (Higgins et al. 2018). This study conducted a thematic content analysis to examine the nature and extent of, and level of user-engagement with, the appealing strategies used by digital marketers to promote energy drinks to young people.

4.4.3 Method

Digital platforms including three most popular Social Networking Sites (SNS)- Facebook, Twitter, YouTube (Winpenny et al. 2013), the brands' official websites, and advergames identified on the websites of nine common energy drink brands in Australia (brands which were available in two largest Australian retailers and service station) were selected for investigation. All textual and visual content created by the brands on the identified digital platforms were captured in June 2015, over a one-month period. Websites and advergames content were captured over two days in July 2015. A coding tool was developed based on past content analyses of food and beverage companies' marketing tactics (Freeman et al. 2014). The marketing strategies were coded for the prevalence of different promotional appeals.

Quantitative and qualitative content analysis methods were used to provide descriptive statistics of prevalence of techniques and a thematic analysis of messages contained in the marketing content, respectively Frequencies were tabulated for each code. Accumulated "likes" or "shares" were tabulated to indicate user-engagement. A validity checking was undertaken by a second independent coder tocode 10% of data. There was 98% agreement between coders across all variables/codes. An inductive approach was employed to identify frequently occurring themes and categories emerging from the content. Codes underlying broad themes were developed before they were categorised into finer, specific themes.

4.4.4 Results

Overall 624 textual and visual elements were extracted from 134 posts on Facebook, 96 tweets on Twitter, and 82 videos on YouTube. Each post/tweet/video produced one textual and one visual element since one post comprised a photo or video as well as a caption.

Textual and visual elements were separately coded for the most relevant promotional appeal. Seven out of the nine identified energy drink brands had an official website. Fifteen advergames were identified from the websites.

The highest level of user engagement found on the investigated SNS was on Facebook, with more than 45 millions "likes" while more than 160,000 "shares" accumulated on the identified Facebook page The promotional appeals derived from the three SNS are presented in Figure 4.1. TheStrategies were thrill-seeking elements (27%), characters' attribute promotional appeals (25%), success or accomplishment elements (19%), and brand community building (16%). Other identified marketing appeals included humour, product promotion, sexual suggestiveness (e.g. female ambassadors in revealing outfits), and music. The most prominent appeal strategies derived from the websites and advergames were aligned with the strategies found on SNS.

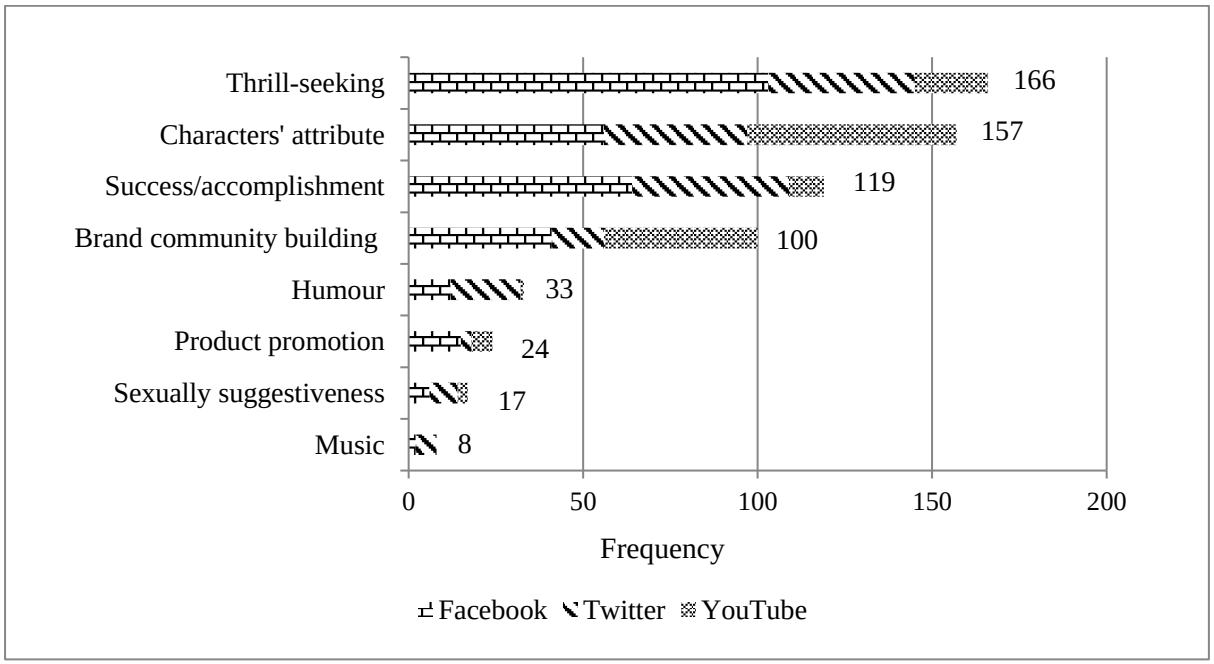

Figure 4.1: Prominent appeal strategies on energy drinks' social networking sites

Thematic content analysis revealed four main themes from the energy drinks digital marketing contents: (i) *online social connectivity* - a large number of SNS posts were not obvious about the brand itself or product promotion; instead, these posts seemed more like a conversation to engage online users to stimulate user-engagement; (ii) *desired social identity* - brand imagery or the images that young people desire to be associated with were frequently depicted in the online contents, particularly sports identities/ celebrities; (iii) *enhancement of performance* - relationship between consumption of these drinks and accomplishments were implied in the identified posts, and; (iv) *enhancement of mood*- emotional appeals such as humour and thrill-seeking were commonly used in the online interactions with users.

4.4.5 Discussion

Our findings suggest that energy drink marketers engaged with potential consumers through digital media and particularly Facebook, as evidenced by the large volume of user-engagements (i.e. 'likes', 'shares'). This demonstrated the potential influential power of digital marketing on young people's food-related attitudes and behaviours. Such potential influence has been confirmed in an experimental study that demonstrated SNS was an effective marketing channel in enhancing users intention to spread the electronic word-of-mouth about the marketed product especially among users who are highly connected on the Internet (López et al. 2016).

Energy drink marketers used digital platforms, and especially SNS, to create and reinforce online social connectivity and desired social identity among users. Online social connectivity has been identified as an important success element by marketers (López et al. 2016). Social interaction has become an important motive for many online users who are drawn to platforms that enable interactions with other people (López et al. 2016). SNS practices have

also been associated with young people's construction of desired identities. As revealed in a qualitative study on SNS alcohol marketing, young people reported to have carefully engaged ('liked' or 'shared') brand content to reflect their desired social identities among their peers (Purves et al. 2018). A recent study found that energy drink users tended to engage in problematic behaviours including alcohol, tobacco and drug use (Trapp et al. 2014). This is a concern when considering that energy drinks are often marketed as aiding positive traits such as enhanced performance and mood.

Regulatory approaches and strategies to counter the effects of unhealthy food and beverage marketing on the Internet are close to non-existent in Australia. However, a number of regulatory measures in place or approved in some countries for restricting unhealthy digital food and beverage marketing towards children, may provide some insights for possible regulations to guard adolescents or young adults against negative effects of such marketing. For example, the UK and South Korea both have regulations restricting unhealthy food marketing to children and adolescents through any form of marketing communication including the Internet (World Cancer Research Fund International 2018). These types of regulatory measures could potentially be expanded to cover young adults, particularly when considering 1948 Universal Declaration of Human Rights (Article 25), where the right to health is not qualified by an age limit. Other potential strategies to counter the effects of unhealthy food and beverage digital marketing include the adoption of applications to block advertisements on the Internet and SNS (e.g. Adblock Plus) and counter-marketing interventions to enhance digital food marketing literacy among young people (Kelly et al. 2015). Restrictions on the promotion of unhealthy food and beverages, including energy drinks on the digital media may improve health behaviours of young people.

CHAPTER FIVE: HOW DOES DIGITAL MARKETING EXERT EFFECTS?

5.1 Preface

In the preceding chapter (Chapter 4), the appeal strategies utilised by energy drink marketers on digital platforms to attract young people were analysed and discussed. The most evident findings were the marketers using digital media, and especially SNS, to reinforce online social connectivity and create brand imagery that young people may desire to associate with, in order to attract this age group. Marketing content that implied these products would enhance the physical performance and mood was also prominent on the digital platforms. Further exploration of these findings was warranted.

This chapter discusses an experimental study undertaken to answer the following research questions: Is there an association between exposure to digital marketing and young adults' beliefs about, attitude towards, the intended purchase and consumption of energy drinks? And, why do digital promotional strategies appeal to young adults? The participants' attitudes towards, purchase and consumption intentions of, energy drinks were measured before and after exposure to the digital marketing contents of two popular energy drink brands – Red Bull and V Energy. The two brands were selected based on their differing marketing strategies and their inclusion of prominent appeal strategies identified in Chapter 4.

The experimental study comprised both quantitative and qualitative components. The quantitative components aimed to investigate whether short-term exposure to energy drink online marketing exerted influences on young adults' food-related attitudes and behaviours, using pre-test post-test survey measurements before and after the experiment. The qualitative components aimed to gain more in-depth understanding of why young adults' food-related

attitudes and behaviours changed or remained the same after the exposure. This was achieved using a semi-structured interview after the experiment. As was explained in the conceptual framework section of Chapter 3, the individuals' abilities to evaluate marketing persuasion appeals may be influenced by different levels of information processing. The ELM proposed that there are *central* and *peripheral* levels of information processing and these levels may be determined by the types of persuasive marketing strategies used. The *central* cues are used when active evaluation is needed while the *peripheral* cues involve less effort of thinking (Cacioppo & Petty 1984). Qualitative data from the semi-structured interviews were analysed using the ELM.

This chapter has been written and published during the course of this degree in a peer-reviewed journal (Appendix B). It is presented as it was published with minor modification in formatting – i.e. referencing style, figure and table numbers – to ensure cohesion within the thesis and to conform to the University of Wollongong's referencing style.

Citation: Buchanan, L, Kelly, B & Yeatman, Y 2017, 'Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation', *PLoS One*, vol.12, no.2, pp.e0171226-1-e0171226-16.

Authors' contribution: L. Buchanan had responsibility for study design, data collection, data analysis and interpretation, and writing the original draft of the manuscript. B. Kelly and H. Yeatman contributed to the conception of the study, analysis and interpretation of the results, and review and editing of the manuscript.

The key findings from this study have also been presented at the following conference:

- Emerging Health Policy Research Conference, Charles Perkins Centre, University of Sydney, 13 July 2016.
- Public Health Association of Australian (PHAA) 44th Annual and 20th Chronic Diseases Network Conference in Alice Spring, Australia, 18-21 September 2016.

5.2 The publish article- Exposure to Digital Marketing Enhances Young Adults' Interest in Energy Drinks: An Exploratory Investigation

5.2.1 Abstract

Young adults experience faster weight gain and consume more unhealthy food than any other age group. The impact of online food marketing on "digital native" young adults is unclear. This study examined the effects of online marketing on young adults' consumption behaviours, using energy drinks as a case example. The elaboration likelihood model of persuasion was used as the theoretical basis. A pre-test post-test experimental research design was adopted using mixed-methods. Participants (aged 18-24) were randomly assigned to control or experimental groups (N= 30 each). Experimental group participants' attitudes towards, and intended purchase and consumption of energy drinks were examined via surveys and semi-structured interviews after their exposure to two popular energy drink brands' websites and social media sites (exposure time 8 minutes). Exposure to digital marketing contents of energy drinks improved the experimental group participants' attitudes towards, purchase and consumption intention of energy drinks. This study indicates the influential power of unhealthy online marketing on cognitively mature young adults. These study draws public health attentions to young adults, who to date have been less of a focus of researchers but are influenced by online food advertising.

5.2.2 Introduction

Young adults are experiencing rapid weight gain (Allman-Farinelli et al. 2008; Nikolaou et al. 2015) and are at greater risks of developing weight-related non-communicable diseases over time. Data from the Australian National Health Survey 2014-15 indicated that approximately 39% young adults aged 18-24 years were overweight or obese (Australian Bureau of Statistics 2015) and this age group consumed more unhealthy food and beverages than any other age groups (Australian Bureau of Statistics 2014a). Despite the growing health issues among this age group, research about influences on young adults' consumption behaviours is scarce.

This study defined "young adults" as those aged 18 to 24 years, consistent with Australian National Health Survey 2014-15 classification and also previous publications on young Australians' health-related behaviours (Perez et al. 2012; Miller & Hickling 2006; Piggford et al. 2008). The years from 18 to 24 years mark a distinct life stage. Some have defined this stage as "emerging adulthood", a transitional stage between adolescence and full adult status (Arnett 2004). Legally, they are adults, but they are still on the learning stage of becoming adults where many experience transitions from high school to work or college, from the parental home to their own accommodation, from passive meal recipients to first time food purchasers and preparers (Blatterer 2010; Freeman et al. 2015). The fact that this age group may face new challenges in life such as food purchase and preparation, but legally no one holds responsibilities over them, may open up new marketing opportunities for food and beverage industry. As indicated by Freeman et al. (Freeman et al. 2015), the food industry may shift their promotional target from children to young adults in response to the increasing scrutiny over children's unhealthy food marketing exposures.

Unhealthy food and beverage marketing towards young adults through the digital media is of particular relevance. This form of marketing is less scrutinised than the traditional marketing on television or in newspapers (Montgomery et al. 2012) but is pervasive for young adults who have grown up surrounded by digital technologies and have a strong online presence (Montgomery & Chester 2009). The more engaging and invasive forms of advertising on digital platforms, such as through social media sites and advergames, have been linked to unhealthy food consumption among children (Alvy & Calvert 2008; Kelly et al. 2008). Such online advertising may also be appealing to young adults. It is unknown how the persuasive messages of online food marketing influence young adults, as it is often assumed they have developed cognitive capabilities to critically interpret the persuasive intent of marketers (Baumgartner 2012).

Unhealthy products that are particularly relevant to digital food marketing and young adults are energy drinks. Energy drinks are a new beverage category, defined as *"a non-alcoholic caffeine containing beverage typically consumed to provide an energy boost or for mental alertness"* (Food Regulation Standing Committee Caffeine Working Group 2013). Common examples of these drinks in the Australian market include Red Bull, Mother, V, Monster and Rockstar. Energy drinks were selected as a case example in this study due to a number of reasons. Firstly, consumption of energy drink is a public health concern. These drinks contain high amounts of caffeine and stimulants such as guarana, ginseng, and B groups vitamins, with varying amounts of sugar and protein, which can be linked to weight gain and a range of adverse health events such as headache and irritation (Heckman et al. 2010; Huhtinen et al. 2013; Schwartz et al. 2015). A recent review conducted by Visram and colleagues (Visram et al. 2016) further suggested that the consumption of energy drinks are associated with risky behaviours, including sensation-seeking and self-destructive behaviours. Secondly, these

drinks are marketed to improve alertness, concentration, and stamina (Fogger & McGuinness 2011) and may therefore be especially popular among young people, students and party-goers. Thirdly, energy drink brands predominantly utilise digital media for promotional purposes, for example, website online games and social media platforms such as Facebook, Twitter, and YouTube (Rudd Center for Food Policy & Obesity 2011). Lastly, marketing of energy drinks is not strictly regulated in Australia. Energy drinks are regulated under the Food Standard Australia New Zealand (FSANZ) code in relation to product composition and labelling (Food Standard Australia New Zealand 2013). The advertising and marketing code established by the Australian Association of National Advertiser (AANA) does not cover marketing activities on digital platforms (Australian Beverages Council 2011).

The mechanism of the influences of digital marketing on food-related behaviours is not well understood. Marketing literature exploring tobacco, alcohol, and fast food products adopted the notion of marketing receptivity to understand consumers' responses to marketing contents. This approach suggested that consumers' responses progress through several stages before any behaviour change. Responses range from low receptivity (exposure to marketing contents), to medium receptivity (attend to and understand the marketing contents), and then high receptivity (development of a cognitive or affective response to the marketed products or brands) (Pierce et al. 1998; McClure et al. 2013a; McClure et al. 2013b). Evidence of consumers' receptivity to the marketing contents includes indications of positive cognitive or affective responses to the marketing contents or communications (Pierce et al. 1998), such as a change in attitude towards the marketed product or brand (Morgenstern et al. 2011). Attitude changes have been recognised by numerous psychological theories as one of the intermediate mental effects of marketing exposure (Austin et al. 2006; Morgenstern et al. 2011).

The present study applied the concept of marketing receptivity to explore the possible causal pathway where exposure to digital food marketing may prompt a mental response (attitude change) as well as intermediate cued purchase and consumption intentions of the marketed brands and products. We hypothesised that exposure to digital marketing of energy drinks would enhance young adults' attitudes towards, intended purchase and consumption of, these drinks. Findings from our study indicated that digital food marketing has impacts on young adults' attitude towards and their intended purchase and consumption of energy drinks.

5.2.3 Materials and Methods

This study adopted a pre-test post-test control group experimental model. A mixed-methods design was employed utilising a quantitative survey technique complemented by qualitative semi-structured interviews. All materials and procedures were approved by the University of Wollongong Human Research Ethics Committee (HE15-280). Participant Information Sheets were provided to the participants and their written consents were obtained before their participation in the study.

5.2.3.1 Participants

Young adults aged 18 to 24 years were recruited in the Illawarra region of New South Wales, Australia, between July 2015 and March 2016. Recruitment included promoting the study through handing out flyers in university lectures and community colleges, at bus-stops, community centres, local sports clubs and a local theme park, posts and tweets on social media sites, and snowball sampling. The study was promoted as a study about Internet usage and food consumption. The advertisement did not make it explicit that it would be asking questions about energy drinks marketing in order to recruit both energy drinks users and non-

users. Any young adults aged 18 to 24 years and knew how to use the Internet met the inclusion criteria. Individuals who were interested to participate in the study contacted the lead author via email or phone. Times and venues (all public spaces) were then arranged for the study at participants' convenience. Participants were randomly assigned to either the control or experimental group. Randomisation was performed after the study sessions were booked; the lead author randomly picked out sealed envelopes that contained control or experimental surveys. Participants who completed the study were entered into a lucky draw of iTunes and Coles (major supermarket) vouchers of different values ($10-$50) as recognition for their time.

5.2.3.2 Materials

5.2.3.2.1 Exposure experiment

The selected exposure materials to examine the impact of digital marketing on the participants in the experimental group were the websites and social media sites of two popular energy drink brands: *Red Bull* and *V Energy*. These two brands were selected due to their popularity (The Australian 2011) and their distinctive marketing appeal strategies, as revealed in a previous content analysis of a range of energy drinks' websites and social media sites (Buchanan et al. 2016); *Red Bull* positions their brand as a high budget, sophisticated energy drink product by sponsoring high risk, expensive sports such as Formula 1, while *V Energy* used sophomoric humour such as superhero to attract audiences. Control group participants were exposed to the websites and social media sites of two nut bar brands; *Carman's* and *Go Natural*. An online search of beverage products for the healthy comparison was conducted but beverage options such as soft drinks, sports drinks and water products do not use online brand images promotion. The two nut bar brands were selected as they were relatively healthy food products in comparison to energy drinks and their use of positive

brand images as marketing strategies was similar to the selected energy drink brands. All of the selected sites were publicly accessible. The researcher audited the sites every fortnight to ensure the exposed materials were consistent across the period between the first participant, who completed in July 2015, and the final participant, who completed in March 2016.

5.2.3.2.2 Pre- and post-test surveys

Experimental and control group participants self-completed the paper-based surveys at pre- and post-test. Participants' attitudes towards, and purchase intention of, the two test energy drink brands and energy drink products in general were measured at both time points. Nut bars, soft drinks and muesli bars brands were included in the surveys as distractors. Participants' attitudes towards the energy drinks were measured by the mean of five 7-point semantic-differential scales; "bad/good", "unfavourable/favourable", "unappealing/appealing", "likeable/unlikeable", "pleasant/unpleasant". This scale had previously been used by other studies to measure brand attitudes (Bellman et al. 2011; Ballouli & Hutchinson 2013) and was derived from Batra and Stayman (Batra & Stayman 1990). The internal consistency of these measures was (Cronbach Alpha Analysis) $\alpha = 0.941$. Participants' purchase intentions of energy drinks were measured by the widely used 5-point intention scale (Jamieson and Bass 1989), ranging from "definitely will not purchase" to "definitely will purchase". Demographic and Internet usage questions were also included in the pre-test survey.

5.2.3.2.3 Post-test semi-structured interview

The post-test quantitative survey was supplemented by a semi-structured interview. The audio-recorded interviews were conducted by the lead author, who also wrote field notes during the interviews. Research into young adults' beliefs and attitudes towards digital

marketing of food and beverage products is scarce and hence the interview was used to provide insights into participants' thoughts and feelings about the exposed materials, brands and energy drink products in general. The interview questions were categorised into two main sections: (i) perceptions of brands, where participants' were asked their views of the test energy drink brands, as well as the exposed websites and social media sites, and (ii) perception of energy drinks, where participants were asked about their own experiences and thoughts of energy drinks products and the consumption of these drinks among young people. Questions about nut bar products were included for the control group participants.

5.2.3.3 Procedures

Participants took approximately 30 minutes to complete the study: pre-test survey (approximately 10 minutes), exposure experiment (fixed length- 8 minutes; 4 minutes on each brand), and post-test survey and semi-structured interview (approximately 10-15minutes). Participants filled in the pre-test survey before they were asked to browse the two selected energy drink brands' websites and social media sites (nut bar brands for control group). Participants were told to browse the sites freely using a laptop; they were allowed to browse whatever contents on the sites they chose, e.g. photos, videos, company information, advergames, recipes, as long as they stayed within the same website. After browsing the online materials, participants were asked to fill in the post-test survey and to participate in the interview. To measure participants' food and beverage products preferences, participants were asked to select one food or drink item from a range of food and beverage products photos displayed on a poster before and after the experiment. To mimic a real-life 'unsupervised' web browsing scenario, the study was conducted at community settings (e.g., meeting rooms, cafes and parks) and participants were not 'supervised' during the study. Participants in the experimental group were given a Fact Sheet about the negative impacts of

energy drinks consumption (Australia Drug Foundation 2012) after the completion of the study.

5.2.4 Statistical analysis

5.2.4.1 Quantitative data analysis

A pilot study (*N*= 16) was conducted to pre-test the research instruments and to calculate the required sample size using G-Power statistical analysis software (Heinrich-Heine-Universität Düsseldorf 2016). The input parameters entered into the software were effect size = .8, α = .05, and between-groups comparison effect size of attitude change towards energy drinks observed in the pilot study (d= .52). A total sample size of 60, 30 each in two groups, was needed to obtain statistical power of .92 level (Cohen 1992).

Statistical analysis was undertaken using the Statistical Package for Social Sciences (SPSS) for Windows, version 21. The internal consistency of the previously standardised attitude scale was examined by Cronbach Alpha Analysis. Based on data distribution, Independent sample t-tests or Mann-Whitney U tests were utilised to determine the changes in attitudes towards, and purchase intention of, energy drinks. Fisher-exact test was used to examine the changes in intended consumption of energy drinks before and after the experiment. *P* values of < 0.05 were considered statistically significant.

5.2.4.2 Qualitative data analysis

Qualitative data were analysed based on the field notes taken by the lead author during the interviews. The audio-recordings were used to check the completeness of written field notes as soon as the interviews were completed and while the reflections remained fresh (Halcomb and Davidson). The primary purpose of the semi-structured interview was to identify key

factors which had led to the changes in attitudes measured after the experiment and verbatim transcription of the audio data was not taken. The benefits of using written field notes during the interview have been demonstrated by several researchers (Fasick 1977; Halcomb and Davidson); not only that it may improve the efficiency, it may also ease the difficulties of data coding. Content analysis (Elo & Kyngas 2007) was then conducted to elicit common themes arising from the participants' responses about their perceptions of the energy drink brands as well as the exposed online materials. Content analysis involved open coding where the written notes were read through several times and grouping and categorisation where the headings were assigned to related contents before they were grouped into higher order categories (Elo & Kyngas 2007). The co-author who was not involved in the data collection reviewed the established themes and the respective responses. The established themes were categorised based on the elaboration likelihood model (ELM) of persuasion as discussed below.

5.2.5 Theoretical Framework

The elaboration likelihood model (ELM) of persuasion as proposed by Cacioppo & Petty (1984) has particular relevance to the examination of food marketing impacts. Various studies have used ELM to understand the influences of product advertising (Bhutada et al. 2012; Kim et al. 2016; Moore & Rideout 2007). ELM is a framework that describes the thinking processes that might occur when an individual is exposed to persuasive communication. ELM highlights dual routes of information processing, central and peripheral, that may lead to changes in an individual's attitudes and behaviours (Bhutada et al. 2012; Kim et al. 2016). In the central route, an individual engages in high level information processing, that is, he/she carefully thinks about the persuasive message. An example of a central cue is the nutrition claims of a food product. In contrast, a peripheral

route involves low level of information processing. An individual processes the message without much cognitive effort. A common peripheral cue used by advertisers is emotional appeals, such as fun and happiness (Kim et al. 2016). The more pertinent element of ELM in this study was anticipated to be the peripheral route, as previous analyses of the digital marketing contents of energy drinks brands (Buchanan et al. 2016) have found that the energy drinks industry steered away from actual product promotions/information and used emotional appeals like excitement to engage young adults.

5.2.6 Results

Participants in the experimental and control groups were similar (statistically) in gender, age, education levels, Internet usage, and their usual Internet activities (Table 5.1). Although attempts were made to recruit participants from various demographic backgrounds, the majority of the study participants were university students (*N*= 49/60). At pre-test, participants' attitudes towards, and purchase intention of, the test energy drinks brands and energy drinks products in general were similar between experimental and control groups (Table 5.1).

Table 5.1: Characteristics of study participants at pre-test

Characteristics	Experimental (*N*= 30)	Control (*N*= 30)	*P* value	Total (*N*= 60)
Gender [a]			.194	
Male	16	11		27
Female	14	19		33
Age [b], *Mean yr*	20	20	.892	20
Education level [c]			.643	
High school or equivalent	3	4		7
TAFE qualification or equivalent	3	5		8
Bachelor's degree	21	17		38
Postgraduate qualification	3	4		7
Internet usage [c]			.068	
Several times a week	2	1		3
Every day	13	7		20
Several times a day	15	22		37
Usual Internet activity [c]				
Emails	28	26	.977	54
Online games	9	10	.783	19
Facebook	28	28	1.000	56
YouTube	23	24	.756	47
Twitter	6	4	.492	10
Online shopping	16	17	.442	29
News	15	17	.608	22
Attitude[b] *Mean± SD*				
Red Bull	- 0.5 ± 1.4	- 0.5 ± 1.7	.947	- 0.5 ± 1.5
V Energy	- 0.5 ± 1.4	- 0.8 ± 1.4	.402	- 0.7 ± 1.4
Energy drink products (general)	- 0.4 ± 1.5	- 0.5 ± 1.8	.824	- 0.5 ± 1.6
Purchase Intention[c] *Median (mode)*				
Red Bull	-1.0 (-2.0)	-1.0 (-2.0)	.588	-1.0 (-2.0)
V Energy	-1.0 (-2.0)	-1.5 (-2.0)	.753	-1.0 (-2.0)
Energy drink products (general)	-1.0 (-2.0)	-1.0 (-2.0)	.545	-1.0 (-2.0)

[a]Pearson Chi-square test
[b]Independent sample t-test
[c]Mann-Whitney U test

5.2.6.1 Attitudes and purchase intention

Effect sizes of the study were calculated based on the attitudes changed; the between group effect size was *d*= 0.71 while the within group effect was *d*= 0.55. Both were medium effect sizes (Cohen 1992).

Participants in the experimental group had significantly better attitudes towards the two test energy drink brands *Red Bull* (*t*(42)= -4.1, *p*= .000) and V Energy (*t*(53)= -3.5, *p*= .001), as well as energy drink products in general (*t*(50)= -4.5, *p*= .000) than the control group

participants after the experiment. After the experiment, participants in the experimental group compared with control group participants also showed significantly greater purchase intention of the two test energy drink brands *Red Bull* (*U*= 222.5, *p*= .000) and *V Energy* (*U*= 243.5, *p*= .000), as well as energy drink products in general (*U*= 395.5, *p*= .300) (Table 5.2).

Table 5.2: Comparisons of participants' attitudes towards and purchase intention, of energy drinks after the experiment

Measures	**Post-test – Pre-test (*N*= 60)**	**Test result**
Attitude[a] *Mean ± SD*		
Red Bull	0.3 ± 1.0	*t*(42)= -4.1, *p*= .000*
V Energy	0.3 ± 1.1	*t*(53)=-3.5 , *p*= .001*
Energy drinks products (general)	0.2 ± 0.8	*t*(50)=-4.5 , *p*= .000*
Purchase Intention[b] *Median (range)*		
Red Bull	0.0 (-2.0 - 3.0)	*U*=222.5, *p*= .000*
V Energy	0.0 (-2.0 - 2.0)	*U*=243.5 , *p*= .000*
Energy drinks products (general)	0.0 (-2.0 - 3.0)	*U*= 395.5, *p*= .300*

*Significantly different when $p < .05$
[a]Independent- samples t-test
[b]Mann-Whitney U Test

Between group comparisons showed that at post-test, the participants in the experimental group showed significantly more positive attitudes towards the two test energy drink brands (*Red Bull*'s mean difference of an average of 5 x 7-point semantic scales = 1.0±1.8, *p*= .038; *V Energy*'s mean difference= 1.2±1.6, *p*= .006) and energy drinks products in general (mean difference= 1.0±1.6, *p*= .028), and slightly greater purchase intention of *V Energy* (Z= -2.01, *p*= .044) as compared to the control group (Table 5.3).

Table 5.3: Between group comparisons at post-test

	Brand/Product	Experimental	Control	*P* value
Attitude[b] (5 item; -3 to 3) *Mean ± SD*	Red Bull	0.3 ± 1.7	- 0.7 ± 1.8	.038*
	V Energy	0.2 ± 1.7	- 1.0 ± 1.5	.006*
	Energy drink products (general)	0.2 ± 1.5	- 0.8 ± 1.7	.028*
Purchase intention[a] (-2 to 2) *Median (mode)*	Red Bull	0.0 (-2.0)	-1.0 (-2.0)	.087
	V Energy	-0.5 (-2.0)	-2.0 (-2.0)	.044*
	Energy drink products (general)	-1.0 (1.0)	-1.5 (-2.0)	.108

*Significantly different when $p < .05$
[a] Mann-Whitney U Test
[b] Independent- samples t-test

Attitudes of the experimental group participants towards the two test energy drink brands (*Red Bull*'s mean difference= 0.8±1.5, *p*= .001; *V Energy*'s mean difference 0.8±1.6, *p*= .001), as well as energy drink products in general (mean difference = 0.6±1.5, *p*= .000) were all significantly improved after the experiment (Table 5.4). Participants' average attitude scale values all moved from the negative to positive ends. Although the experimental group participants' purchase intentions towards the energy drinks remained negative, their purchase intentions of the two test energy drink brands (*Red Bull* Z= -2.724, *p*= .006; *V Energy* Z= -3.000, *p*= .003) were improved statistically significantly after the test. Surprisingly, control group attitudes towards energy drink products in general, and their purchase intention towards the two energy drink brands were significantly worsened at post-test although they were not exposed to any energy drinks materials. As a side note, control group participants showed better attitude towards and greater purchase intention towards one of the test nut bar brands.

Table 5.4: Within group comparisons

Experimental				
	Brand/Product	**Pre-test**	**Post-test**	***P* value**
Attitude [b] (5 item; -3 to 3) *Mean ± SD*	Red Bull	- 0.5 ± 1.4	0.3 ± 1.7	.001*
	V Energy	- 0.5 ± 1.4	0.2 ± 1.7	.001*
	Energy drink products (general)	- 0.4 ± 1.5	0.2 ± 1.5	.000*
Purchase intention [a] (-2 to 2) *Median (mode)*	Red Bull	-1.0 (-2.0)	0.0 (-2.0)	.006*
	V Energy	-1.0 (-2.0)	-0.5 (-2.0)	.003*
	Energy drink products (general)	-1.0 (-2.0)	-1.0 (1.0)	.223
Control				
Attitude [b] (5 item; -3 to 3) *Mean ± SD*	Red Bull	- 0.5 ± 1.7	- 0.7 ± 1.8	.129
	V Energy	- 0.8 ± 1.4	- 1.0 ± 1.5	.447
	Energy drink products (general)	- 0.5 ± 1.8	- 0.8 ± 1.7	.036*
	Carmans' nut bar	1.0 ± 1.3	1.8 ± 1.0	.000*
	Go Natural's nut bar	0.7 ± 1.2	1.2 ± 1.2	.068
	Nut bar products (general)	1.2 ± 1.1	1.4 ± 1.0	.108
Purchase intention [a] (-2 to 2) *Median (Mode)*	Red Bull	-1.0 (-2.0)	-1.0 (-2.0)	.046*
	V Energy	-1.5 (-2.0)	-2.0 (-2.0)	.046*
	Energy drink products (general)	-1.0 (-2.0)	-1.5 (-2.0)	.589
	Carmans' nut bar	1.0 (1.0)	1.0 (1.0)	.003*
	Go Natural's nut bar	1.0 (1.0)	1.0 (1.0)	.951
	Nut bar products (general)	1.0 (1.0)	1.0 (1.0)	.052

*Significantly different when $p < .05$
[a] Wilconxon- Signed Rank Test
[b] Paired-samples t-test

5.2.6.2 Consumption intention

The participants involved in the exposure experiment had significantly enhanced intention to consume energy drinks post-test. Seven participants showed positive change, from no intention to consume energy drinks at pre-test to intended to consume energy drinks at post-test, $\chi^2(1)=7.9$, $p= .005$ (Table 5.5). The number of participants in the experimental group who selected energy drinks from the poster rose from four to eleven after the experiment. Control group participants had greater intention to consume nut bar products after the experiment $\chi^2(1)=16.6$, $p= .000$.

Table 5.5: Participants' intended consumption of the energy drinks and nut bar products after the experiment

Consumption Intention[a] *Count*	Experimental (*N* = 30)	Control (*N* = 30)	Positive change from pre-test to post-test[b] (*N* = 60)	Test result
Energy drinks products (general)				
Pre-test	4	2		
Post-test	11	0	7	$\chi^2(1)=7.9$, $p= .005$*
Nut bars products (general)				
Pre-test	4	6		
Post-test	2	19	13	$\chi^2(1)=16.6$, $p= .000$*

[a]Fisher's exact Test
[b]Weight cases command was conducted before chi-square analysis on a contingency table. Due to the small sample size, Fisher's exact Test was used.

5.2.6.3 Qualitative interview findings

5.2.6.3.1 Appealing factors of the exposed online materials and brands

Consistent with the quantitative survey findings, a number of participants in the experimental group reported the exposure to the online materials had somewhat improved their feelings towards the test brands, with the majority of the participants showing more positive attitudes towards at least one of the test energy drink brands. A range of appealing elements (Figure 5.1) on the test brands digital platforms changed participants' attitudes towards these brands. The most widely mentioned factors were the corporate social responsibility initiatives reported by the brands, community involvement and sponsorship from *Red Bull*. For instance one participant *(participant a, male, 18 years)* noted,

> *"Feel like they are trying to do good stuff for the environment; their cans are 100% recycled, and minimise transportation…that's a good thing, also they sponsored a lot of sports…".*

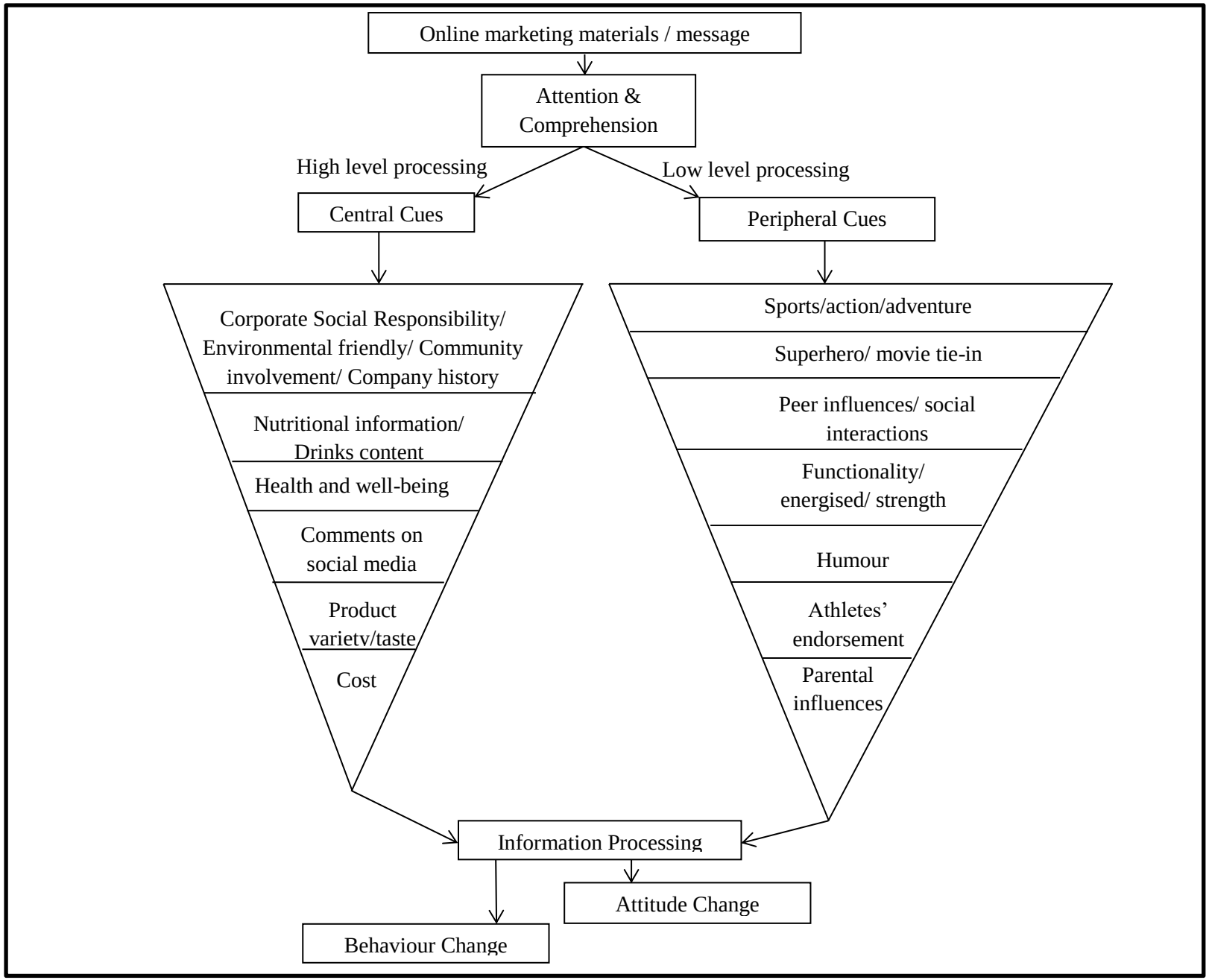

Figure 5.1: Qualitative findings using ELM as a theoretical basis

Both brands listed their drink products' nutritional information on their websites. The majority of participants favoured the "honesty" of the brands, for example,

> "*V showed their nutrient contents, I was surprised by the low guarana content, it is not shady at all, really appealing". (participant b, male, 18 years)*

Only a minority of the participants took a more critical approach towards the nutritional claims made by the brands,

> *"I looked at the ingredients of both brands, so superficial, no scientific proof benefits… some of them are just a sentence, don't believe that it will help me to concentrate at all". (participant c, male, 22 years)*

The superhero theme of V Energy appeared to be a selling point for some participants. *"I am into Avengers (movie) that would convince me to purchase V over Red Bull…" (participant d, female, 18 years).* The majority of the participants visited the test brands' social media sites (mainly Facebook) during the experiment. The comments that were posted from other Facebook users seemed to have greater influence on the participants than what was posted by the companies;

> *"V's Facebook page was filled with positive comments from the others and the website was more engaging (not just about sports)…", "Red Bull's Facebook page made it even more unappealing, a lot of people left negative comments on their Facebook page…" (participant e, female, 22 years).*

5.2.6.3.2 Views on energy drinks

Not many frequent energy drinks users participated in the study. The majority of the participants reported they had their first energy drinks when they were teenagers, usually under peer influence,

"I first tried energy drinks in Y8 or 9, friends bought me the drink, felt cool to drink it, we were under 18, can't drink alcohol, so it was the next best thing..." (participant f, female, 18 years).

Although most of the participants reported they had 'grown out of' / no longer consumed these drinks, many reported consuming energy drinks for functionality purposes, such as for stamina for assignments, computer games, shift work and parties. Almost all participants were aware of the 'practice' of mixing alcohol with energy drinks and many reported they had consumed these drinks when going out parties with friends, despite reporting they knew the drinks were 'bad' for them.

5.2.7 Discussion

This study demonstrated the potential influential power of food and beverage digital marketing on cognitively mature young adults. After a short exposure to digital marketing materials, participants had a better impression of, greater purchase intention and were more likely to consume energy drinks. Of surprise was the revelation that central cues, such as corporate social responsibility as demonstrated by the brands, was reported by the participants in a manner that implied they had greater impacts on the young adults than the peripheral cues like emotional appeals.

The positive association between digital marketing and attitudes towards the beverage brands observed in this study contributes new insights into the influences of online environments on young adults' food-related behaviour. There have been a growing number of research reported on the use of digital platforms for marketing that have established the association between online alcohol marketing and consumption behaviours (Gordon et al. 2011; Hoffman

et al. 2014; Jones & Magee 2011; McClure et al. 2016). These studies, however, were cross-sectional designs and could not determine the direction of causality. There was one controlled intervention where the authors compared the effects of alcohol marketing online between states in the United States of America (USA) that do or do not have bans on advertising alcohol. This study found digital marketing of alcohol reduced the effectiveness of alcohol advertising bans (Goldfarb & Tucker 2011), which indicated the influential power of online marketing materials on consumers' attitudes towards food products. Previous studies on alcohol have argued that exposure to marketing contents enhanced consumers' receptivity to alcohol marketing (McClure et al. 2016; Morgenstern et al. 2011). Although not the same product category, our findings contribute to this literature showing how young adults may become receptive to risky product marketing.

The study reported here found that young adults' attitudes towards, purchase and consumption intentions of the brands were influenced by digital marketing. Online content that was most highly reported to have influenced their attitudes towards the brands were linked to central information processing cues, that information cognitively elaborated through the central route, as described in the ELM framework. There is a general assumption that young adults are cognitively mature and possess the ability to understand the persuasive intention of marketers (Cornish 2014). However, our findings suggest that although young adults realised the online materials were designed to promote energy drink products, they were not necessarily capable to defend themselves against marketing content such as the brands' community involvement, contribution to charities, and environmentally friendly efforts (i.e. corporate social responsibility). Young adults also valued the 'honesty' of the brands by declaring the content of their drinks.

The ability of these central cues to distort the promotion intentions of the online marketing among young adults was unexpected. Previous assessments of the content of food advertising, especially among children, has generally found that emotionally evocative peripheral cues in television advertisements were used to attract audiences (Kim et al. 2016; Warren et al. 2008). Our experiment only included a short exposure and the improvements in attitudes towards brands may only have a short lasting effect. However, this finding was significant since central cues are believed to have more profound impact on attitude changes and more predictive of future behaviour than the peripheral cues (Cacioppo & Petty 1984). Additionally, participants in this study were mainly educated young adults who reported to be aware of the health problems of energy drink products. The impact of online marketing could be greater among young adults who are less educated or less health conscious.

The classification of central cues in this study was based on the assumption that participants may take more time to evaluate information such as the brands' contributions to the environment. Although literature on corporate image advertising has previously discussed the notion of the processing of corporate social responsibility messages from the ELM insights (BöGel 2015; Alan & Lester 2009), none have explored whether these messages are evaluated through the central or peripheral route. Participants' pre-existing attitudes and personal values towards the corporate social responsibility issues may influence how they assess these messages (Wang & Anderson 2011). For instance, an individual who does not favour corporate social responsibility work may automatically process the message as sceptical (peripheral route to persuasion) whereas an individual who favours the notion of corporate social responsibility may scrutinise the information further (central route to persuasion) (Alan & Lester 2009). Given that the corporate social responsibility practices portrayed on the websites were mainly written contents and required participants' thoughtful

assessment, corporate social responsibility practices were classified as central cues in this study.

The interviews in this study also revealed other factors that contributed to young adults' consumption of energy drinks, including peer influences and social opportunities involving mixing alcohol with energy drinks at parties. It was unknown whether these factors were induced by the peripheral cues of the online marketing messages (e.g. energised, fun). Many participants reported to have first started consuming energy drinks during adolescence. Future studies may need to include participants from a younger age group.

Although not the main focus of this study, control group participants showed more positive feelings, greater purchase and consumption intentions towards one of the nut bar brands. Oddly, they also reported more negative attitudes towards the energy drink brands although they were not exposed to any energy drinks related online materials. One possible explanatory for this was that the healthy messages delivered on the nut bar brands sites may have counteracted participants' desire to have unhealthy products. This unexpected finding highlighted a potential avenue for public health intervention. Positive brand image portrayed by the food companies may be effective in increasing healthy food consumption while reducing unhealthy food consumption. Future studies may explore further on this.

5.2.7.1 Strengths and limitations

The strengths of this study included the use of qualitative interviews to supplement the findings of quantitative surveys, and the application of ELM as a theoretical framework to better understand the variables that might have influenced young adults during the online exposure. Our randomised controlled-trial was sufficiently powered and statistically

significant changes were found on participants' attitudes, purchase and consumption intentions. However, these findings need to be interpreted with caution since the regional, non-representative convenience sample may limit the generalisability of our findings. Recruitment of young people from lower socio-economic backgrounds remains a challenge but the impact of online unhealthy food marketing on this cohort warrants further investigation. The medium effect size of this study was in accordance with other research on attitudes towards food advertising where small to moderate effect sizes were found (Paek et al. 2011; Dixon et al. 2007). Participants in the control group were more likely to be females and have higher Internet usage. These differences were not statistically significant but could potentially influence the findings, for example, female participants may have different responses to the macho image (extreme sports) of energy drink brands. Another limitation of the study was that participants were given a task to browse the sites during the experiment and thus may have paid more attention than normal to the information presented online. This might explain the highly reported processing of central cues in this study. This could also potentially introduce bias if the participants felt that the researcher anticipated some changes at post-test, although the true motive of the study was masked. As pointed out by other relevant advertising literature, digital marketing exposure is only one of the many factors that influence consumers' receptivity to the marketing contents (Austin et al. 2006; McClure et al. 2013a), further research are required to explore other precursors or influences that lead to young adults' consumption of risky food or beverage products.

5.2.7.2 Conclusions

With the greater interactions of young people with online environments and social media, it is important to understand how young people's consumption patterns and health behaviours may be affected. This study provides useful insights into the online environment that may

contribute to unhealthy behaviours of young adults. Greater understanding of the types of cues and their influences on young adults' attitudes and potentially also their behaviours can inform professional practice and regulatory policies relating to online environments.

5.2.8 Acknowledgements

N/A

CHAPTER SIX: IS DIGITAL MARKETING MORE STRONGLY ASSOCIATED WITH FOOD-RELATED ATTITUDES AND BEHAVIOURS THAN OTHER FORMS OF MARKETING?

6.1 Preface

In the preceding chapter, a sample of young adults was randomly assigned to either an experimental (exposure to eight minutes of digital marketing content of two selected energy drink brands) or control group (exposure to eight minutes of digital marketing content of two selected nut bar brands). After the exposure, the participants in the experimental group reported significantly more positive attitudes, and purchase and consumption intentions towards energy drink products than the control group participants. Another revelation was that a central cue – corporate social responsibility – was reported by the participants in a manner that implied it exerted greater impacts in changing the participants' views regarding these products than the peripheral cues such as emotional appeals.

This chapter examines if digital marketing strategies are more strongly associated with energy drink use than other forms of marketing activities (e.g. traditional media). It also draws on the Theory Planned Behaviour (TPB), as discussed in the conceptual framework (presented in Chapter 3). It examines if the TPB constructs – *attitudes, subjective norms, and Perceived Behavioural Control (PBC)* – mediate the effects of digital marketing on energy drink use. The chapter addresses three research questions: What is the reported awareness of digital marketing of energy drinks among young adults? What is the relative strength of digital marketing as compared to other forms of marketing regarding energy drink use? And what are the mediating effects of the TPB constructs in the relationship between digital marketing and energy drink use?

This chapter concludes that digital marketing has a stronger influence on young adults' food-related attitudes and behaviours as compared to other forms of marketing. The results are relevant to the public health community to inform potential strategies to counter the effects of such marketing.

This chapter was written and accepted for publication during the course of this degree in a peer-reviewed journal (Appendix C). It is presented as it was published with minor modification in formatting – i.e. referencing style, figure and table numbers – to ensure cohesion within the thesis and to conform to the University of Wollongong's referencing style.

Citation: Buchanan, L, Yeatman, H, Kelly, B & Kariippanon, K 2018, 'Digital promotion of energy drinks to young adults is more strongly linked to consumption than other media marketing', *Journal of Nutrition Education and Behavior*, vol.50, no.9, pp.888-895.

Authors' contribution: L. Buchanan was responsible for the study design, data collection, data analysis and interpretation, and writing the original draft of the manuscript. H. Yeatman and B. Kelly contributed to the conception of the study, analysis and interpretation of the results, and review and editing of the manuscript. K. Kariippanon contributed to the review and editing of the manuscript.

Key findings from this study have also been presented at the 15th World Congress on Public Health 2017 in Melbourne, Australia, 3-7 April 2017.

6.2 The published article- Digital promotion of energy drinks to young adults is more strongly linked to consumption than other media marketing

6.2.1 Abstract

Objective: To examine if digital marketing strategies are more strongly associated with energy drink use than other marketing and if the Theory of Planned Behaviour (TPB) constructs mediated the effects of digital marketing on energy drink use.

Design: A cross-sectional online survey using TPB was administered in 2016.

Setting: Illawarra region of New South Wales, Australia.

Participants: 359 young adults aged 18-24 years completed the survey. The participants were mainly students.

Main Outcome Measures: Relative impacts of digital marketing and other marketing on energy drink use, and the mediating effects of TPB constructs- attitudes, subjective norm, perceived behavioural control (PBC).

Analysis: Stepwise regression analysis was employed to compare the effects on energy drink use from digital marketing and other marketing. Mediation analysis was used to examine the mediating effects of the TPB constructs.

Results: Digital marketing was more strongly associated with young adults' energy drink use than other marketing. Attitudes, subjective norms and PBC mediated the effects of digital marketing on energy drink use.

Conclusions and Implications: The marketing of unhealthy food and beverages such as energy drink products on the Internet requires greater scrutiny. Future interventions may focus on strategies to attenuate young adults' attitudes towards energy drinks, de-normalise energy drink use, and strengthening self-efficacy to reject energy drinks among this age group.

Key Words: digital marketing; young adults; energy drinks; Theory of Planned Behaviour**;** unhealthy food marketing

6.2.2 Introduction

Digital marketing of unhealthy commodities, including the promotion of products through websites, and social media (Montgomery et al. 2012), has drawn the attention of health care professionals and policy makers for its potential impacts on consumption behaviours (World Health Organization 2016). A large body of research confirms the negative influences of commercial marketing of food and beverages through other forms of marketing and particularly traditional media platforms i.e. television on children (Cairns et al. 2013; Mills et al. 2012; Jenkin et al. 2014). Due to the ubiquitous, interactive and 24/7 availability of digital technologies (Spero & Stone 2004), digital marketing of unhealthy food and beverages may have greater effects relative to other forms of marketing (World Health Organization 2016; Kelly et al. 2015). A systematic review of the effects of digital marketing of unhealthy commodities concluded that digital marketing enhanced young people's beliefs towards, and intended and actual consumption of, these products (Buchanan et al. 2018a). Nevertheless, the relative impact of digital marketing compared to other media marketing is unknown.

The potential negative impacts on young adults of digital marketing of unhealthy products, particularly alcohol and tobacco products, have been documented in previous literature (McClure et al. 2016; Critchlow et al. 2016; Depue et al. 2015). Digital marketing effects of food and non-alcoholic beverage products however, have not been well explored. One experimental study demonstrated that online marketing enhanced young adults' interests, purchase and consumption intentions towards an unhealthy beverage. This evidence refutes assertions that this age group has sufficient cognitive capabilities to oppose marketing

persuasion (Baumgartner 2012; Buchanan et al. 2017). Young adults are a high risk group; they have faster weight gain (Hayes et al. 2017), greater consumption of unhealthy food and beverages than other age groups (Australian Bureau of Statistics 2014a) and live much of their lives on the Internet. In Australia, for example, 98% of young people aged 18-24 years are Internet users (Australian Bureau of Statistics 2016). Marketing strategies incorporating digital media are also likely to appeal to this age group, for instance, through peer-to-peer online interactions on social media. This refers to peer sharing of product information or promotions through active user engagement with social media platforms, such as 'liking' and sharing posts on Facebook (Li et al. 2014).

Energy drinks were chosen as the focus of this study to examine the effects of digital food marketing on young adults. Energy drinks represent a new non-alcoholic product category, first introduced in 1987 (in Austria) by Red Bull (Ali et al. 2015). While global sales of soft drinks are declining (Visram et al. 2017), the energy drink industry is booming, with global sales of USD 50 billion recorded in 2014 (Business Wire). These drinks are in high demand, especially among young adults (Zest Health Strategies 2011), and have become a central part of partying and sporting culture (Breda et al. 2014). These drinks contain caffeine, taurine, vitamins and other ingredients such as guarana and ginseng. They are commonly marketed to boost physical and mental performance (Food Regulation Standing Committee Caffeine Working Group 2013) and the popularity of these drinks has been fuelled by these claims (Seifert et al. 2011). Consumption of energy drinks is a public health concern among children, adolescents and young adults (Seifert et al. 2011), as they may cause dental problems (Jain et al. 2012), cardiovascular and neurological issues (Ali et al. 2015), and in rare cases, death (Higgins et al. 2018).

6.2.2.1 Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) (Ajzen 1991) proposes that an individual's likelihood to perform a behaviour is based on his/her attitudes, subjective norms, and perceived behavioural control (PBC), which ultimately leads to his/her behaviour (Ajzen 1991). It is based on three constructs of behaviour: *attitudes,* where an individual has negatively or positively evaluated a behaviour; *subjective norms,* the individual's perception of social norms that encourage or discourage engagement in the behaviour; and *PBC,* the individual's perceived ease or difficulty in controlling his/her behaviour (Ajzen 1991). Based on TPB, the effects of environmental factors (digital marketing) on behaviour (energy drink use) would be mediated by these three constructs (Caperchione et al. 2008; Desrichard et al. 2007) (Figure 6.1). This study tested the mediating effects of TPB constructs in the relationship between digital marketing and energy drink use. A theoretical understanding of digital marketing-induced unhealthy behaviours may elucidate guidance for more effective health interventions.

It was hypothesised that: 1) digital marketing would be more strongly associated with young adults' energy drink use than other marketing; and 2) TPB constructs would mediate the effects of digital marketing on energy drink use.

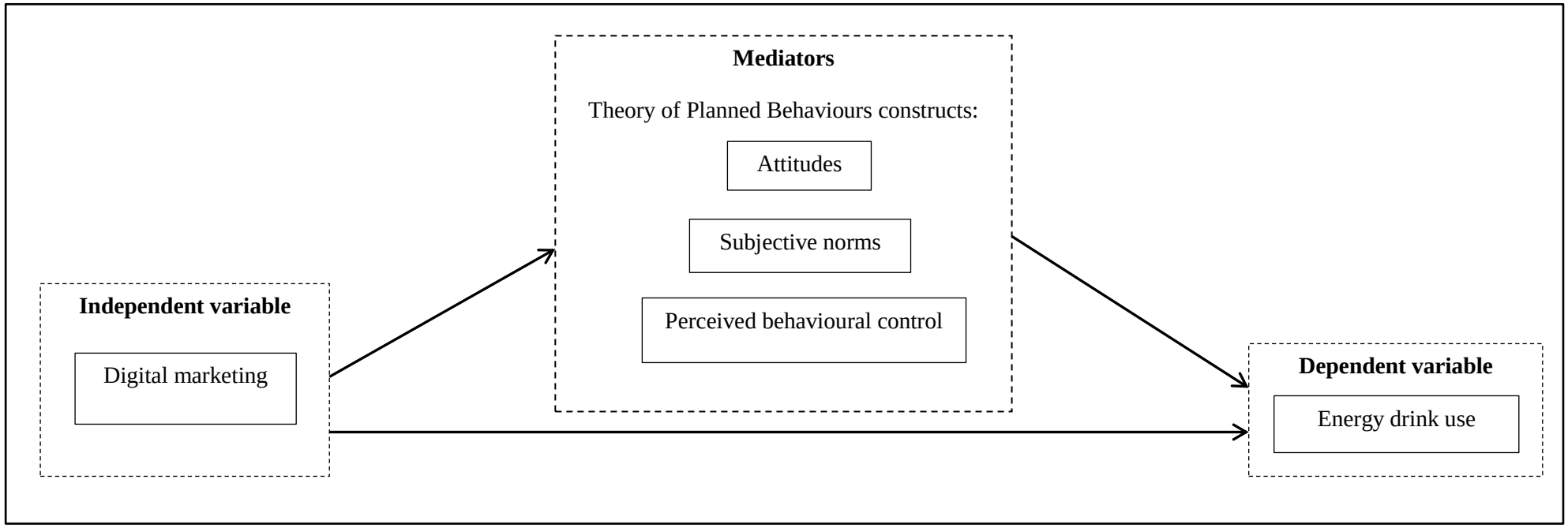

Figure 6.1: Conceptual Framework of mediating effects of Theory of Planned Behaviour constructs in the relationship between digital marketing and energy drink use

6.2.3 Methods

6.2.3.1 Recruitment

Young adults (18-24 years) were recruited in 2016 through advertisements in lectures and on students' online learning platforms at one university in the Illawarra region of New South Wales, Australia, and through flyers distributed at a local community college, library, youth centre, community centre, sports clubs, and a shopping centre.

Participant information was included on the survey opening page and respondents indicated their consent to participate by continuing. Survey respondents remained anonymous. This study was approved by the University of Wollongong Human Research Ethics Committee (HE16/038).

6.2.3.2 Measures

The 44-item online questionnaire using SurveyMonkey (SurveyMonkey.com, LLC, Palo Alto, CA) was pilot tested with persons within the target group (n= 15) to check for understanding of the items and to estimate the time required to complete the survey. Minor modifications were made to question format and wording. The questionnaire took approximately 10 minutes to complete. The questionnaire included demographic questions on age, gender, work status and education status and residential postal code, which was then converted to socio-economic status (SES) based on the ABS Socio-Economic Indexes for Areas (SEIFA) (Australian Bureau of Statistics 2014b). Questions asked about: exposure to, and engagement with, the marketing activities of energy drinks; attitudes towards, subjective norms about, and PBC over energy drink use; significant others' (parents/ partner/ friends/ siblings) acceptability of their energy drink use (OK/Not OK); and energy drink use status. Frequency and amount of energy drinks consumption were also self-reported in the

questionnaire. However, as there were few high energy drink users, subsequent data analyses categorised respondents into energy drink users and non-users.

Seven items used four-point Likert scales ranging from 0='Not at all' to 4='Often' to examine exposure to marketing of energy drinks for any brand on digital media and other media (e.g. saw advertisements of energy drinks on the Internet including social media sites) (Table 6.1). A further seven items measured engagement with energy drink marketing activities. Respondents were asked to indicate whether or not (Yes/No) they had ever engaged with digital or other marketing for energy drinks (e.g. played energy drinks related online games). Average exposure and sum of engagement scores, were calculated. The higher scores reflected greater exposure to, or engagement with, marketing activities.

Attitudes towards energy drink products and their use (8 questions) (e.g. energy drinks improve performance mentally and physically), subjective norms about energy drink products and use (2 questions,) (e.g. energy drinks are commonly consumed by students and peers), and PBC of energy drink use (5 questions) (e.g. confident to refuse to drink even under peer pressure) were measured. These items were measured on five-point Likert scales ranging from 1= 'Strongly disagree' to 5= 'Strongly agree'. Scores were averaged for each person for each factor; higher scores indicated more positive attitudes towards energy drinks, greater subjective norms about energy drinks and use, and greater PBC over energy drink use. These measures were derived from previous studies that explore young people's views on energy drinks (Buchanan et al. 2017; Visram et al. 2017). Cronbach's Alpha coefficients were calculated for the attitudes (α= 0.77), subjective norm (α= 0.91), and PBC (α= 0.74) measures based on the results from the main study. Scores above 0.70 indicated acceptable measure of internal reliability (Tavakol & Dennick 2011).

6.2.3.3 Covariates

Covariates adjusted for in the regression models included age, sex, SES, student and work status, and perceived significant others' acceptability of their energy drink use.

6.2.3.4 Statistical analyses

Data were analysed using SPSS (SPSS Version 21.0, SPSS Inc., Chicago, IL, 2012). Independent samples t-tests and Pearson chi-square tests were conducted to compare the differences between energy drink users and non-users with regard to their age, sex, student and work status, exposure to, and engagement with digital and other forms of marketing, and their attitudes, subjective norms, and PBC about energy drink use. *P* values of < .05 were considered statistically significant.

Stepwise regression was performed to examine the relative impacts of digital marketing compared to other marketing, with energy drink use as the dependent variable. Energy drink use (Yes or No) was regressed on exposure to other forms of marketing in Step 1. In Step 2, energy drink use was regressed on exposure to other forms of marketing, and exposure to digital marketing. In Step 3, energy drink use was regressed on exposure to other forms of marketing, exposure to digital marketing, and engagement with other forms of marketing. Finally, in Step 4, energy drink use was regressed on exposure to other forms of marketing, exposure to digital marketing, engagement with other forms of marketing, and engagement with digital marketing. Regression analyses were conducted using: exposure to other forms of marketing entered as independent variable in Block 1; exposure to other forms of marketing, and exposure to digital marketing entered as independent variables in Block 2; exposure to other forms of marketing, exposure to digital marketing, and engagement with other forms of

marketing entered as independent variables in Block 3; followed by exposure to other forms of marketing, exposure to digital marketing, engagement with other forms of marketing, and engagement with digital marketing entered as independent variables in Block 4.

Mediation analysis was conducted to examine whether the association between digital marketing and energy drink use variables was mediated by the TPB constructs using the PROCESS macros for SPSS (Hayes 2017). The significance of the direct effect of independent variable (digital marketing) on the dependent variable (energy drink use) while controlling for the mediators (TPB constructs), as well as the significance of indirect effect transmitted by the mediators were simultaneously examined using PROCESS. The significance of the effect was reflected by the unstandardized regression coefficient. Covariates were controlled in this model.

This macro used bootstrapping methods developed by Preacher and Hayes (Preacher and Hayes 2008) for testing mediation analysis, using a resampling procedure of 1,000 bootstrap samples. Bootstrapping methods provided bias-corrected confidence intervals (CIs) (95%); each effect was considered statistically significant if the range of CI did not include zero at $P < .05$.

6.2.4 Results

A total of 359 young adults completed the survey. Respondents were mainly students, aged 20 years, worked part-time and from middle socio-economic backgrounds. Overall, 53% of respondents indicated they had consumed energy drinks before, 40% had never consumed energy drinks, while 7% did not indicate their energy drink use status. Energy drink users tended to be males and non-students.

Energy drink users reported significantly greater exposure to, and engagement with, digital marketing activities of energy drinks than non-energy drink users. They also reported significantly greater engagement with other energy drink marketing activities than non-energy drink users. Reported exposure to other energy drink marketing activities was not significantly different between users and non-users (Table 6.1).

Table 6.1: Young adults' exposure to, and engagement with, energy drink marketing and their energy drink use

Measures	Energy drink users (n=192)	Energy drink non-users (n=142)	*P* value
Exposure to digital marketing[a]			0.01*
Internet	169 (88%)	113 (80%)	
Online games	115 (60%)	62 (44%)	
Exposure to other marketing[a]			0.06
Broadcast (eg. TV, radio)	179 (93%)	134 (94%)	
Printed	142 (74%)	105 (74%)	
In-store	190 (99%)	134 (94%)	
Sponsorship	173 (90%)	122 (86%)	
Endorsement	170 (89%)	118 (83%)	
Engagement in digital marketing[b]			0.00*
Played online game	58 (30%)	34 (24%)	
Browsed energy drinks website	62 (32%)	16 (11%)	
Clicked on social media sites	68 (35%)	17 (12%)	
Watched energy drinks online videos	82 (43%)	36 (25%)	
Engagement in other marketing[b]			0.00*
Received free samples	139 (72%)	62 (44%)	
Entered lucky draw	63 (33%)	21 (15%)	
Owned branded clothing	28 (15%)	10 (7%)	

Notes: 25 missing cases for energy drinks consumption status.

Level of exposure was measured by 0= Not at all; 1= Very occasional, 2= Sometimes, 3= Often; average score was used in analysis.

Level of engagement was measured by 0= No, 1= Yes; summation score was used in analysis.

**P* value less than 0.05

[a]Independent samples t-test

[b]Pearson Chi-square

Stepwise regression models showed the relative strengths of digital vs. other marketing exposure and engagement with predicting energy drink use (Table 6.2). After controlling for covariates, only engagement with digital marketing significantly increased the likelihood of consuming energy drinks (AOR 1.47, 95% CI=1.02-2.10, $P < .05$). Exposure to digital marketing was not a significant predictor of energy drink use, neither were exposure to, and engagement with other marketing. Exposure to digital marketing did not have significant additional impacts over exposure to other forms of marketing activities on energy drink use (Step 2). However, in Step 4 when engagement with digital marketing was added into the model, the impact of engagement with other forms of marketing activities became insignificant. This showed that the impact of engagement with other forms of marketing was mediated by the engagement with digital marketing.

Table 6.2: Stepwise regression analyses predicting energy drinks use from exposure to, involvement in, digital as well as other types of marketing activities

	AOR (CI 95%)	p value of each variable	R^2	P value of the model
Step 1	1.04 (0.60-1.81)	0.89	0.12	0.15
Exposure to other marketing				
			0.14	0.13
Step 2				
Exposure to other marketing	0.83 (0.43-1.59)	0.58		
Exposure to digital marketing				
	1.35 (0.86-2.10)	0.19		
			0.17	0.05
Step 3				
Exposure to other marketing	0.82 (0.43-1.59)	0.56		
Exposure to digital marketing				
	1.23 (0.78-1.95)	0.37		
Engagement with other marketing				
	1.56 (1.03-2.35)	0.04*		
Step 4			0.21	0.02*
Exposure to other marketing	0.79 (0.40-1.53)	0.45		
Exposure to digital marketing				
	1.08 (0.67-1.75)	0.78		
Engagement with other marketing				
	1.43 (0.93-2.20)	0.10		
Engagement with digital marketing				
	1.47 (1.02-2.10)	0.04*		

Notes: After controlling for Block 1: demographic variables (age, gender, SES level, student status, and work status); Block 2: significant others' (parents/partner/friends/sibling(s)) acceptability of their energy drinks use (Ok/Not Ok).

6.2.4.1 TPB constructs as mediating factors

A mediation analysis diagram is presented in Figure 6.2. Since exposure to digital marketing was not significantly associated with energy drink use, the mediation analysis included only engagement with digital marketing as an independent variable. Engagement with digital marketing was significantly related to energy drink use with TPB constructs (β=0.90, $P <$ .05). It was also found that engagement with digital marketing was positively related to attitudes (β=0.11, $P <$ .05), subjective norms (β=0.07, $P <$ .05), while negatively related to PBC (β=-0.13, $P <$ .05). Lastly, the three TPB constructs were all significantly related to energy drink use (attitudes: β=0.87, $P <$ .05; subjective norms: β=1.10, $P <$ .05; PBC: β=-0.99, $P <$ .05). The results of indirect effect between engagement with digital marketing and energy drink use through the TPB constructs had 95% bias-corrected bootstrap CIs that did not include zero (95% CI [0.09,0.48]) indicating significant indirect effect at $P <$ .05. The overall results indicate that greater engagement with digital marketing increased young adults' attitudes and subjective norms related to energy drinks and decreased PBC over energy drink use. In this model, TPB constructs mediated the relationship between engagement with digital marketing and energy drink use.

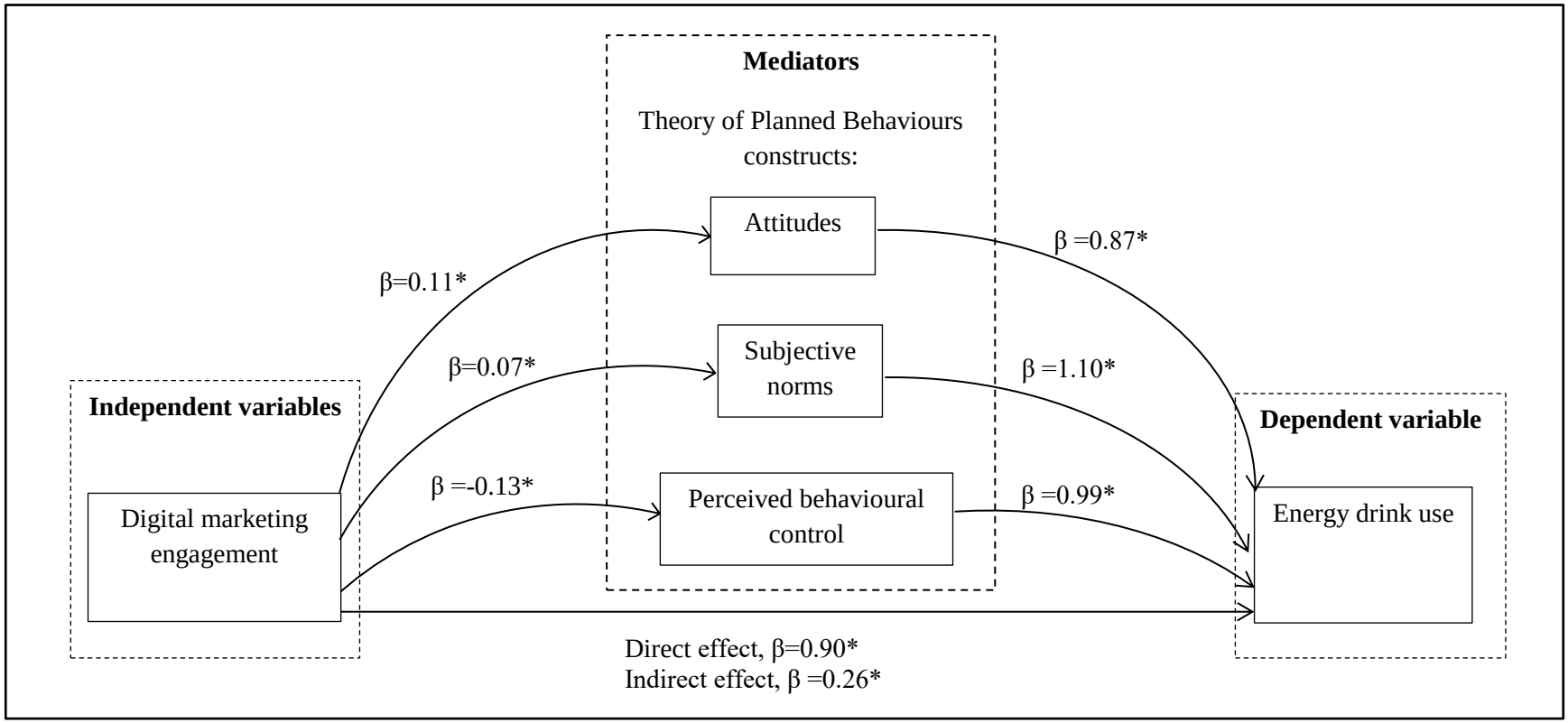

Figure 6.2: Mediating effects of Theory of Planned Behaviour constructs in the relationship between digital marketing and energy drink use

*p<0.05

6.2.5 Discussion

The findings suggest that young adults' engagement with digital marketing for energy drinks was associated with their use of these products. Engagement with digital marketing was more strongly related to energy drink use than exposure to, or engagement with other marketing activities. The relationship between engagement with digital marketing and energy drink use was mediated by TPB constructs including attitudes, subjective norms, and PBC about these products.

The present study adds to the literature on the potential negative health implications of digital marketing on young adults (Buchanan et al. 2017; Critchlow et al. 2016; Depue et al. 2015), and provides evidence that digital marketing may be more strongly related to unhealthy food consumption behaviour than other marketing, especially if young adults engage with digital marketing content. These findings were consistent with a similar study on the effects of marketing on heavy alcohol use among young adults (Critchlow et al. 2016), which found that engagement with digital marketing had a stronger association with heavy alcohol use than the mere exposure to either digital or non-digital marketing.

The findings also confirm that engagement with digital marketing activities is more strongly related to food-related behaviours than mere exposure (Critchlow et al. 2016; Gordon et al. 2011; Lin et al. 2012). This can be explained by the marketing receptivity notion that an individual's attitudinal responsiveness to the marketing content begins with passive marketing exposure (e.g. saw an advertisement on Facebook) and progresses to more active engagement (e.g. clicked on the advertisement on Facebook) (Pierce et al. 1998). It was suggested that an individual was more influenced by the marketing content as their receptivity level increased. It is important to note that although engagement with digital

marketing was found to be the strongest variable that linked to energy drink use, the reported engagement rate with digital marketing activities in the current study was low, ranging from 11% to 43% of participants (Table 6.2). This finding again shows the powerful impact of digital marketing on young adults; even low levels of participation were associated with unhealthy product use.

The findings that attitudes, subjective norms and PBC mediate the relationship between engagement with digital marketing and energy drink use raise several interesting points. First, the mediation by attitudes may be attributed to the relationship between young people's attitudes towards digital marketing (Duffett 2017) or their attitudes towards energy drink use (Bunting et al. 2013). Marketing research has shown that the greater the Internet usage among young people, the more likely they developed favourable attitudinal responses towards the marketing communications on digital channels (Duffett 2017). Second, the significant mediation roles that attitudes and subjective norms played in the relationship between digital marketing and energy drink use may be explained by young people's attitudes towards these products and their perceived norms of energy drink use. Although participants' nutrition knowledge was not measured in this study, previous literature has documented that young people with lower nutrition knowledge were more likely to consume these products than non-users (Hardy et al. 2017). Strengthening nutrition education among this age group may be a way to change young people's attitudes towards these drinks. Young people have also been reported to view energy drink use as a way to shape their social image within their peer group (Bunting et al. 2013). The peer endorsement function on social media (Li et al. 2014), for example exposure to marketing messages when friends 'like' a brand's page, may have enhanced the subjective norms of energy drink use among young adults.

The current study showed that engagement with digital marketing weakened young adults' PBC over energy drink use. This finding aligns with an experimental study that showed marketing on digital media was effective in persuading young adults to purchase and consume energy drinks (Buchanan et al. 2017). The variations in PBC over energy drink use may lead to differences in effects of digital marketing. This could be explored among young adults with different education levels and from different socio-economic backgrounds. Interventions to enhance self-efficacy to make healthful dietary choices are essential for this age group.

6.2.5.1 Limitations

The interpretation of the findings from this study is subject to several limitations. Firstly, this study used one beverage product category as an example; future studies are needed to compare the effects of digital marketing to other marketing on a broader range of food and beverage products. Secondly, the measure in this study was only a brief, cross-sectional survey developed by the researchers, and although it was based on previous marketing and energy drink related literature (Buchanan et al. 2017; Critchlow et al. 2016), it had not been formally validated. Thirdly, the sample in this study comprised mainly university students, which limited the generalisability of the findings to other populations. Fourthly, although the regression model showed that engagement with other forms of marketing was not a significant predictor of energy drink use, the high OR and wide confidence interval indicated that this variable may become significant with a greater sample size. Lastly, the cross-sectional data may not accurately reflect mediation effects although mediation analysis has been undertaken on cross-sectional data in previous studies (Desrichard et al. 2007; Diez-Fernandez et al. 2017).

6.2.5.2 Implications for research and practice

Findings from this study contribute to a growing body of evidence suggesting that digital marketing is negatively linked to young adults' food-related behaviours and is more strongly associated with these behaviours than other forms of marketing. This finding could be explored further in future research that examines food-related behaviours, especially among young adults who spend a significant amount of time on the Internet. Public health professionals have advocated stronger regulations on unhealthy food and beverage promotion to children, especially via traditional media. Such public health advocacy could be expanded to include restriction of unhealthy online marketing and the impacts of such marketing on adults. Restricting the marketing of unhealthy food and non-alcoholic beverages towards young adults could be more challenging than restricting such marketing to children given that legally this age group has responsibility for their behaviours. However, young adults' unhealthy behaviours require public health attention. This study identified digital marketing was effective in promoting unhealthy beverage consumption among young adults. Although food and non-alcoholic beverages are legal commodities, high rates of non-communicable diseases globally highlight the need to focus on, and potentially restrict, the ever-expanding marketing strategies within the online environment. For health interventions, digital marketing is an important target for reducing unhealthy consumption among young adults. Findings from this study suggest the negative impacts of digital marketing require consideration for inclusion in future interventions that focus on strategies to attenuate young adults' attitudes towards certain products, de-normalise unhealthy consumption patterns, and strengthen self-efficacy to decrease the attraction of unhealthy foods to this age group.

6.2.6 Acknowledgements

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CHAPTER SEVEN: OVERALL DISCUSSION AND CONCLUSION

7.1 Preface

This chapter presents an overall discussion of the major findings of the combined quantitative and qualitative results derived from the three studies previously described. Using energy drinks as a case study, this research revealed the wide scope and creative marketing strategies generated by the unhealthy food and beverage industries to engage young adults. Under experimental conditions, the study revealed that even short-term exposure to this form of marketing can enhance young adults' interest in, and even their purchase and consumption intentions of, unhealthy products. Semi-structured interviews with young adults revealed the marketing strategies that this group favoured, including companies' corporate social responsibility activities. These strategies were not necessarily viewed as 'marketing' by young people, highlighting their susceptibility to these techniques. Finally, the research demonstrated a stronger association between digital marketing *engagement* and young adults' likely consumption of this unhealthy product compared with other forms of marketing activities and simple *exposure* to digital marketing. The relationship between digital marketing engagement and young adults' energy drink use was found to be statistically significantly mediated by the three constructs of the Theory of Planned Behaviour (TPB), which are, attitudes, subjective norms, and perceived behavioural control (PBC).

The rapid proliferation of digital marketing and its widespread use to promote unhealthy products such as energy drinks is of public health concern (Montgomery & Chester 2009). Strategies are needed to reduce the effects of digital marketing on unhealthy behaviours. This chapter will outline a number of potential approaches to reduce unhealthy product marketing

on the Internet. Implications for future research, significance of this research, the strengths and limitations, as well as the overall conclusion are also presented.

7.2 Introduction

The aim of this research was to explore the influences of digital marketing on young adults' food-related attitudes and behaviours, using energy drinks as an exemplar. Marketing of unhealthy food and beverages through digital media may be anticipated to achieve similar or even stronger harmful effects on consumers than the already documented harmful effects of commercial marketing (Cairns et al. 2013; Hastings et al. 2003). The use of a mixed methods approach offered both a numeric and textual reflection of this phenomenon. The quantitative methods confirmed the extent and effects of digital marketing, while the qualitative methods revealed the appeal factors of digital marketing that exert effects on young adults.

7.3 Summary and integration of the findings

7.3.1 The range and extent of marketing strategies on the digital platforms

The extent of marketing activities on digital platforms and their reach was confirmed by the high level of user engagement (e.g. 'likes' and 'shares') on the SNS of energy drink brands. A number of prominent appeal strategies were identified. They included thrill-seeking elements, characters' attributes and promotional appeals, success or accomplishment elements, and brand community building.

The digital marketing strategies appeared to target young people, as indicated by the common themes derived from the analysis of the textual and visual brand-generated content collected over a one month period. These themes included online social connectivity and desired social identity. These findings aligned with the results of the literature review, which found that

earned media (where the marketing effects are contributed from peer endorsements, i.e. likes and comments on SNS by other online users) may be more influential on young people than the more explicit forms of marketing activities through owned (i.e. posts from company on their brand page) or paid media (i.e. display advertising). Previous qualitative studies (Atkinson et al. 2017; Lyons et al. 2015; Niland et al. 2017) had also revealed that young people reported sharing product-related content with peers online or receiving peer endorsement of product-related content on their SNS pages (e.g. friends liked or shared the brand activities, resulting in brand-related information appearing on their own SNS pages). This type of digital engagement was not considered to be marketing, as the young people had denied directly engaging with marketing content on the Internet. This is an important distinction about which the public health professionals and researchers need to be cognisant, to ensure they communicate the marketing content of this type of engagement and seek further empirical evidence related to such activities through future research.

7.3.2 The association between digital marketing and young adults' food-related attitudes and behaviours

For the first time, a controlled experimental design was applied to investigate the impacts of digital marketing on young adults' food-related attitudes and behaviours. This study was designed to overcome the limitations of previous, mainly cross-sectional studies, which did not permit deducting of the direction of the relationship between marketing exposure and consumer outcomes. The experimental study confirmed that even short-term exposure to digital marketing content resulted in young adults having more positive attitudes about, and greater purchase and consumption intentions towards, energy drink products.

7.3.3 The digital marketing strategies that appeal to young adults

The blurred lines between marketing content, online peer interactions, or the companies' corporate social responsibility activities, make it challenging for young adults to protect themselves from this novel form of marketing. It also presents challenges for the public health community to develop strategies to safeguard young adults from such marketing. Through semi-structured interviews after the exposure experiment, this study revealed that the most widely reported appeal factor was the brands' corporate social responsibility initiatives (e.g. brands' support for charities or their production of environmental friendly products). It was likely that young people viewed corporate social responsibility activities as being, at least partly, philanthropically intentioned. Such activities generated goodwill for companies and likely contributed to their broadly-based marketing portfolios.

The interviews also revealed that after the young adults were exposed to the digital marketing content of popular energy drinks, the participants' interests and views regarding the exposed brands were positively influenced. This influence occurred through the comments from other users on SNS and the appealing images of sports celebrities or superheroes on the websites and SNS. The participants' views of the appealing elements, particularly the thrill-seeking elements, aligned with those identified in the thematic content analysis study of the energy drink brands' digital platforms. This finding confirms the clear marketing intent of digital platforms. This overt use of digital platforms for marketing is not currently well recognised in the current marketing regulations of unhealthy products and is worthy of further exploration.

7.3.4 The reported awareness about digital marketing among young adults

The effects of digital marketing identified in the experimental study were investigated for their wider relevance through a study of a larger cohort of young adults (N=359). This study adopted a quantitative cross-sectional survey design.

Overall reported exposure to, and engagement with, digital marketing of energy drinks was found to be low (i.e. less than 50% of the participants reported ever engaging with digital marketing of energy drinks). However, the engagement with digital marketing was found to be significantly associated with the participants' energy drink use status, despite the low level of engagement reported. Low levels of reported engagement with this marketing could be, partly, a result of under-reporting. As has been identified in the previous systematic review and in the experimental study (Buchanan et al. 2017; Buchanan et al. 2018a), young adults misperceived peer-endorsement as not a marketing activity and hence did not report it to be marketing when surveyed. This differentiation of the types of activities that may/ may not be considered to be marketing needs to be recognised in future research; otherwise, under-reported exposure to or engagement with marketing activities will occur.

7.3.5 The relative strength of digital marketing as compared to other forms of marketing and the potential mediators for digital marketing effects

This research has reported for the first time that energy drink use among young adults is more strongly associated with digital marketing compared to other forms of marketing activities, such as traditional marketing or sponsorship (Chapter 6).

Additionally, this research provided potential avenues for the development of strategies to counter the effects of digital marketing. The significant roles of the three constructs of the

Theory of Planned Behaviour – attitudes, subjective norms and PBC – in the relationship between digital marketing and energy drink use among young adults provide a strong basis upon which public health practitioners may plan future actions to moderate the unhealthy aspects of digital marketing.

7.4 Understanding the effects of digital food and beverage marketing from a theoretical perspective

This research has provided valuable theoretical insights into how digital marketing exerts influence on young adults' food-related attitudes and behaviours. For the first time, a framework based on several social psychology theories has been proposed to understand the effects of digital marketing on young adults' food-related attitudes and behaviours. The findings from this research were consistent with what would be expected from the framework, as summarised in Figure 7.1. This framework offers new dimensions to the conceptual understanding of the commercial marketing effects on young adults as it explored the issue from three dimensions: (i) young adults' desires; (ii) how young adults may process the external influences; and (iii) how these external influences influenced the young adults' internal beliefs and subsequently their actions.

This research successfully demonstrated the utility of Social Identity Theory (SIT) (Tajfel & Turner 1986). This theory offered a lens to understand the ways that marketers used strategies tailored to young people's needs and desires and enabled a comprehensive examination of how unhealthy products' marketing influenced young adults' consumption behaviours. The most prominent appeal strategies revealed in this research were tailored to satisfy young people's desired social identities. The marketers utilised the functions of digital media to create online social community groups where young people could achieve a sense of

belonging, and created a brand imagery that the young people were likely to want to be associated with in order to create brand loyalty among this age group.

The marketing strategies employed by digital marketers clearly showed the industries' motives to target young people. Young adulthood is a transition period marked by a desire for identity exploration and the prioritisation of social relationships (Arnett 2004). The marketing strategies were strongly aligned with these desires. The research findings suggest that although young adults were often viewed to be cognitively developed and having the capability to identify marketers' persuasive intentions, they were found to be influenced by this form of marketing. The findings from this research highlighted the challenges for young adults to identify and appropriately respond to the digital marketing strategies. This form of marketing may also be a challenge for appropriate actions by the public health professionals, as it is widespread, pervasive, subtle in appearance, and attuned with young adults' desired identities and lifestyles.

Elaboration Likelihood Model (ELM) (Cacioppo & Petty 1984) proposed in the conceptual framework contributed to understanding how the appeal strategies from this form of marketing may be processed by young consumers. The appeal factors of digital marketing can generally be categorised into two types of cues: central and peripheral. Findings from this research confirmed the effects of peripheral cues such as the creation of excitement through extreme sports and its influence on increased consumption, thus supporting the findings from previous literature on food marketing (Kim et al. 2016; Warren et al. 2008).

The research also revealed that the cognitively mature young adults were influenced by the central cues, such as the brand's corporate social responsibility. This finding again

highlighted that the digital marketing strategies could be so subtle in appearance that the young adults may not be able to distinguish such marketing content from other content online. This finding also demonstrated that the marketers understand the needs and values of young adults very well. It has been extensively documented in the marketing literature that values played an important role in young adult consumers' purchase and consumption behaviours (Vermeir & Verbeke 2008). The use of corporate social responsibility as a business opportunity has long been recognised within the marketing field (Drucker 1984). However, its underlying marketing motive is only recently being recognised by the public health community, particularly through research on tobacco marketing (Petticrew 2018; Benson 2008).

This research has contributed to the conceptual understanding of the association between digital marketing and young adults' consumption behaviours. The incorporation of the Theory of Planned Behaviour (TPB) (Ajzen 1991) in the conceptual framework allowed insights into the significant roles of young adults' attitudes, perceived subjective norms and PBC in determining the impacts of digital marketing on energy drink use. Future initiatives that aim to mediate the effects of digital marketing should include consideration of these three elements of the TPB.

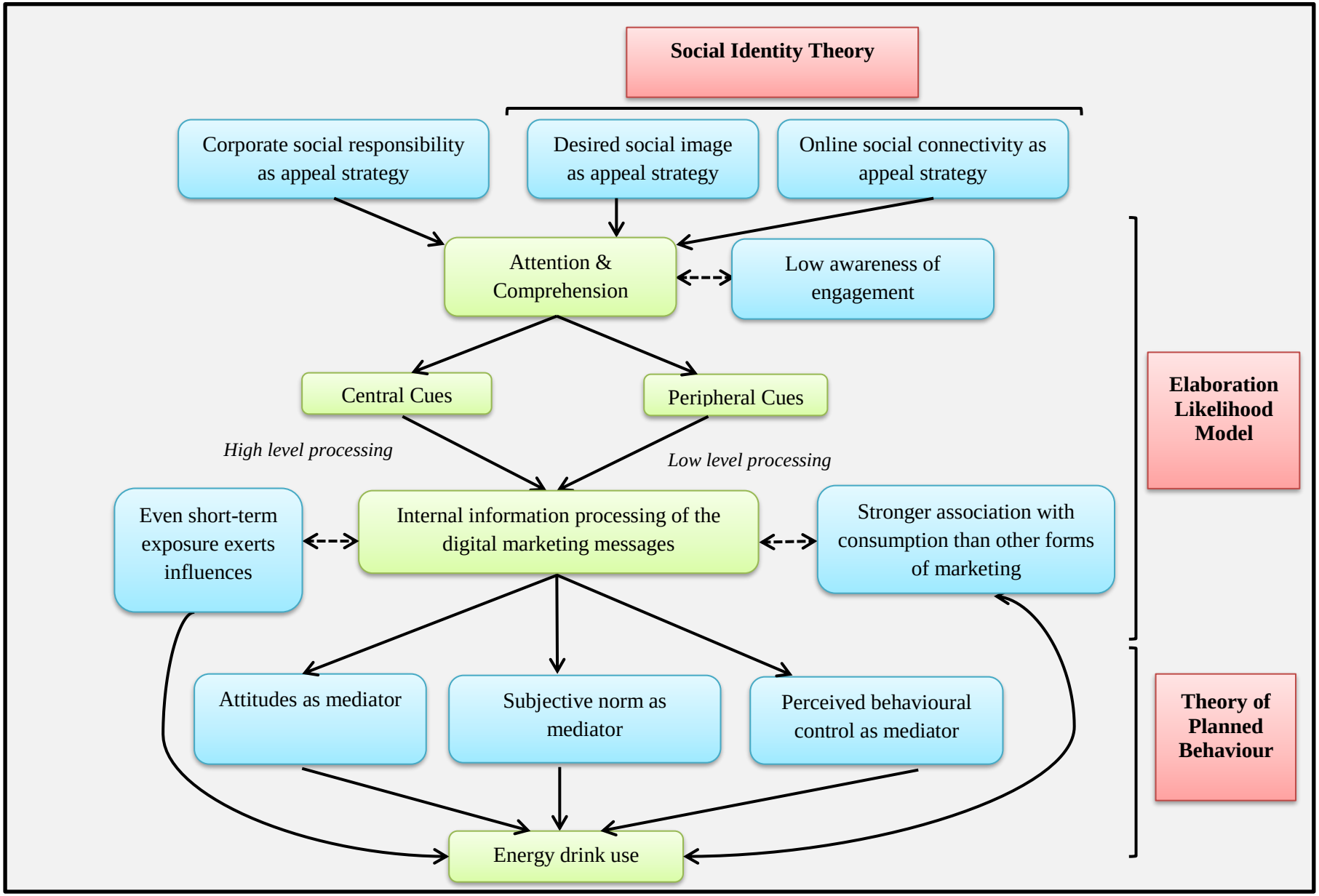

Figure 7.1: Understanding the effects of digital marketing of energy drinks from a theoretical perspective

7.5 Implications for public health actions

This research has provided confirming evidence that the food and beverage industries harness the power of digital technologies and take advantage of the ways that young adults engage with digital media to promote unhealthy products. These activities of such industries are likely to negatively influence the consumption behaviours. The research built on preliminary marketing literature suggested that the nature of digital marketing could make it effective in influencing consumers' choices (Molitor et al. 2013; Andrews et al. 2016). It has contributed to overcoming the dearth of academic studies documenting the effect of digital marketing of food and beverage products on young adults' health behaviours.

At this time, the public health scholars lack the knowledge and methodological tools to address the emerging health issues created by the rapidly changing food and beverages digital marketing environment (World Health Organization 2016). Additionally, in comparison to young children, the impacts of food environments on young adults are largely under-researched in the public health field.

Reducing the impacts of young adults' exposures to digital marketing of unhealthy food and beverages requires the public health practitioners to have a greater understanding of the nature and extent of digital marketing, as well as how this form of marketing exerts influences on young adults. The following sections draw on the conceptual framework and present the potential approaches to manage digital marketing, incorporating the elements of young adults' self-efficacy, regulatory, policy approaches, human rights principles and online privacy expectations. Figure 7.2 then summarises a number of potential approaches that may be adopted to address the digital marketing issues as identified in this research.

7.5.1 Self-efficacy perspective

This research has provided evidence to support the need to build young adults' self-efficacy in repelling unhealthy digital marketing. The findings of this research revealed that young adults are unaware of the 'subtle' forms of digital marketing techniques, such as the effects of earned media and the companies' use of corporate social responsibility as a marketing strategy. Interventions to enhance young adults' awareness of these novel forms of marketing may be useful in countering its effects on food-related attitudes and behaviours.

In relation to the specific food product – energy drinks, this research identified that the attitudes towards energy drinks were significant in mediating the effects of digital marketing. Thus, the development of public health interventions to strengthen the young adults' knowledge about unhealthy products such as energy drinks, as well as their understanding of the persuasive intention of digital marketers, is warranted.

7.5.2 Policy perspective

To support the approaches which focus on the individual, the findings of this research support the need to consider wider, policy approaches that reduce the exposure to and engagement with unhealthy products marketed on the Internet. As identified, the exposure to external influences has detrimental impacts on the young adults' internal beliefs about, the perceived norms of, and their perceived control over, energy drink use. Policies relating to food and beverage marketing are yet to keep pace with the changing media environments, particularly related to digital media. Policies that could be considered may include regulation of marketing, regulation of the products themselves or fiscal measures to make the product less financially attractive.

In Australia, food and beverage marketing is self-regulated by the food industry in collaboration with the advertisers (Australian Association of National Advertiser 2010; Australian Food & Grocery Council 2018). The focus is on restricting the exposure to 'irresponsible' marketing via traditional broadcast media marketing that targets young children. These self-regulatory codes, for example, prohibit food and beverage advertising on television programmes during certain hours of the day when more than 50% of the audiences are children under the age of 12 (Australian Food & Grocery Council 2018).

Mandatory regulations by the government imposed on the marketing of unhealthy food and beverages through digital media exist in a number of countries, including Brazil, Canada, Chile, Finland, Peru, South Korea, and the UK (World Cancer Research Fund International 2018). The existing regulations, however, focus on protecting young children, or at most, young people below 18 years. Across nations, neither the mandatory regulations nor the industry has developed self-regulatory codes to protect the adult consumers.

The findings from this research support the need to consider the protection of adult consumers from the marketing of unhealthy food and beverages through digital platforms. Regulatory approaches to restrict the marketing of unhealthy food and beverages towards adults consumers are generally viewed as beyond the responsibility of the political realm (The Food Foundation 2017). Legally, this age group holds responsibility for their behaviours. However, the UK government's advisory body Public Health England, has extended support for the right of adult viewers to non-exposure to the marketing of unhealthy food and beverages. This advisory group recommended the government to 'significantly reduce(d) opportunities to market and advertise high sugar food and drink products to

children and adults across all media, including digital platforms and through sponsorship' (Public Health England 2015, p.7).

Mandatory regulations of energy drink marketing also exist in a number of countries, including Latvia, Lithuania, and Saudi Arabia (World Cancer Research Fund International 2018; Toumi 2018). The Latvian Energy Drinks Law for example, requires energy drink advertisements to carry warning labels on the negative effects of these drinks and that these drinks are not recommended for children, pregnant and breastfeeding women (World Cancer Research Fund International 2018; Toumi 2018). In Iran, the advertising of soft drinks has been prohibited in all media since 2004, although it is unclear if energy drinks are categorised as soft drinks under the regulation (World Cancer Research Fund International 2018). While these regulations mostly apply to children under 18 years, the findings of this research support the need for considering regulation of energy drink marketing to protect the adults as well. In Australia, marketing of energy drinks are self-regulated by the beverage industry. However, Food Standards Code specifies the maximum amount of substances that can be added to these drinks and labelling of these drinks must state that these drinks are not recommended for children, pregnant or lactating women, or caffeine sensitive persons (Food Standards Australia New Zealand 2013).

This research found that employing of celebrities, especially sports people, to promote energy drinks is pervasive and also persuasive. These findings support the need to explore strategies to de-normalise unhealthy food and beverage products' promotion on the Internet, including consideration of restrictions on the use of promotional characters. Some restrictions on food advertising towards children prohibit the use of animations or characters that appeal to children (World Cancer Research Fund International 2018). The findings reported here

advocate the need to explore the potential benefits of restricting the use of animations and characters in marketing that targets young adults.

This research found that PBC played a significant role in mediating the effects of digital marketing on energy drink use; digital marketing appeared to be more effective with those adults who had lower PBC. This highlights the need to consider policy strategies. As one possible example, the public health researchers have argued that sugary-sweetened products, including energy drinks, were appropriate for taxation policies (Brownell & Frieden 2009; Fletcher et al. 2010). Beverage taxes have been reported to reduce unhealthy consumption in a number of countries, such as Mexico and certain states in the USA (Zhong et al. 2018; Arantxa Colchero et al. 2017). Increasing the cost of energy drinks or reducing the accessibility of these drinks may act to augment the young adults' PBC over energy drink use, thereby increasing their capacity to limit the impacts of digital marketing and potentially reducing consumption of these unhealthy products.

7.5.3 Human rights and online privacy perspectives

The WHO proposed a rights-based framework for the regulation of digital food marketing to children, consistent with the United Nations Convention on the Rights of the Child (United Nations 1989). This framework proposed that while children had the right to participate in digital media, they should not be exploited economically, and their health and privacy must be protected (World Health Organization 2016). The United Nations Children's Fund (UNICEF) highlighted the need to mitigate the harms of digital technologies, for instance, protecting children's right to privacy to ensure safe online spaces (UNICEF 2017).

While there is a growing momentum for harnessing the human right lens to advance public health measures to restrict marketing of unhealthy food and beverages to children (Granheim

et al. 2018), the findings from this research emphasise the need to protect adults' rights as well. A few perspectives outlined in the article by Granheim et al. (2018) could be useful in addressing the issue of digital marketing towards young adults. For instance, *the right to food* is the entitlement of every individuals, *regardless of age*, to have physical and economic access to adequate food, or means for its procurement, at all times (United Nations 1948); however, while 'the rights to health and adequate food cannot be realised without supportive healthy environments' (Granheim et al. 2018, p.4). Food manufacturers' pervasive and aggressive marketing of unhealthy products on the Internet has created an unhealthy food environment and could be considered to have exploited these rights. Indeed, pervasive exposure to marketing and advertising is considered to be in conflict with 'the human rights of freedom of expression, information, thought and conscience' by UNICEF (UNICEF 2018, p.18). The borderless nature of digital marketing also means that protection solely directed at a certain age group is unlikely to suffice.

This research has identified that engagement with digital marketing, leading to unsolicited marketing to others within a person's digital social networks, is more impactful than other forms of marketing. Many users of digital media do not realise that when they like or share a site, this provides access to their online personal information within their friends' networks. To ensure consumers' rights to a healthy food environment, there is a need to consider the protection of online personal information of consumers *at all ages*. Currently, there is no federal legislation in Australia to protect the online privacy of adult consumers, although there have been calls for prohibition of marketers collecting personal information from online users under the age of 14 years (Australian Law Reform Commission 2018). If access to health and well-being is part of human rights, consumers should have the options to protect themselves from being exploited by the marketers of unhealthy food and beverages.

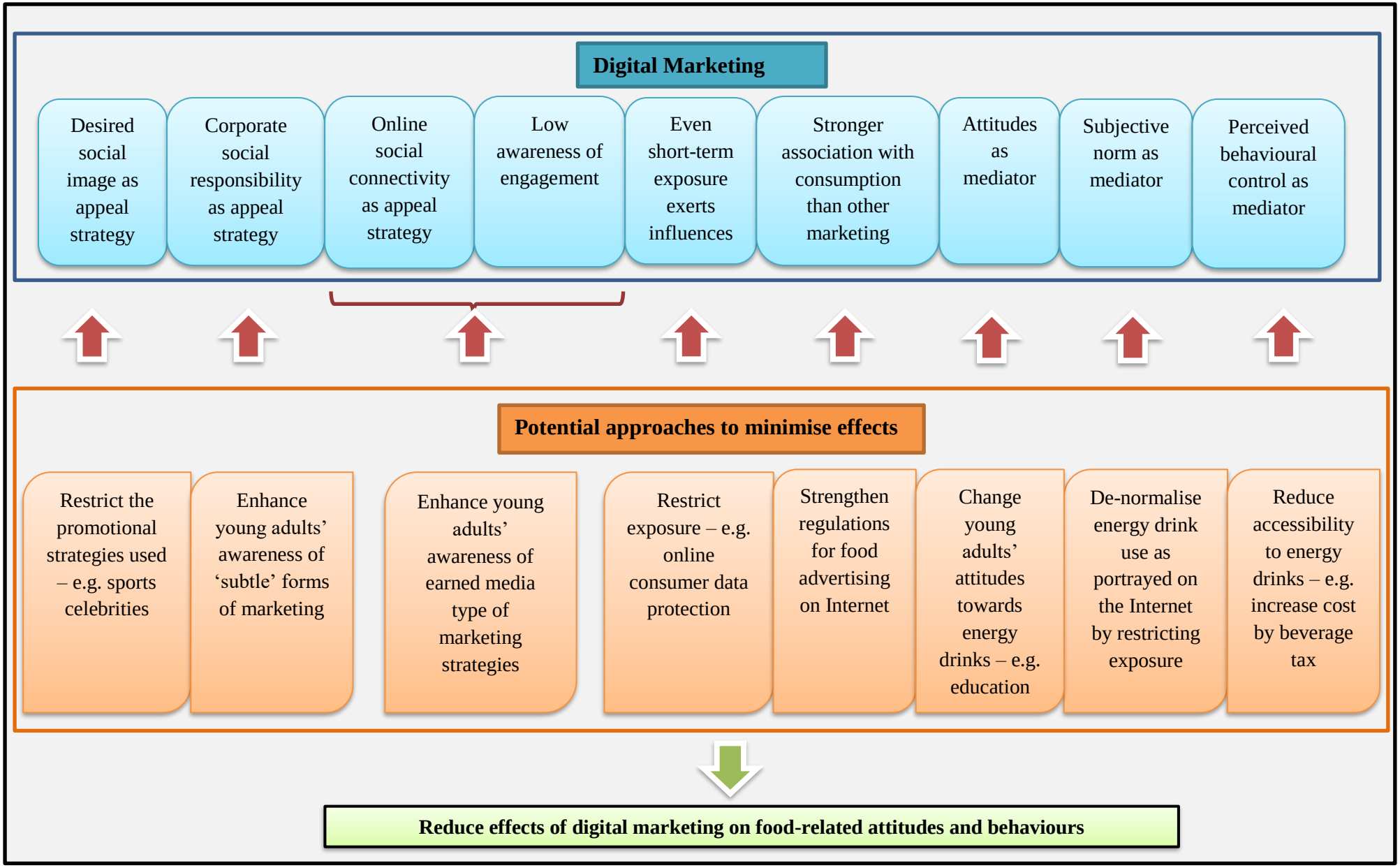

Figure 7.2: Potential approaches to reduce the effects of digital marketing of food and beverages

7.6 Strengths and limitations

A key strength of this research was the use of a mixed methods approach to yield a more comprehensive understanding of the effects of digital marketing of food and beverages. The findings from the quantitative surveys were supported and explained by the qualitative components, including the thematic content analysis and semi-structured interviews.

Another strength of this research was the development of a conceptual framework (Figure 3.2), which directed the exploration of how digital marketing may affect young adults' food-related attitudes and behaviours. This framework incorporated the environmental variables (i.e. exposure to, or engagement with, digital marketing strategies), the influential variables (i.e. internal information processing routes – central or peripheral), and the mediating variables (i.e. attitude, subjective norm and PBC), which led to the outcome behaviours (i.e. energy drink use). The key findings of this research were incorporated into this developed conceptual framework to illustrate the digital marketing strategies that exert influences on young adults (Figure 7.1). Although this research was exploratory in nature, the framework provided a better theoretical understanding of how these variables interacted with each other, and how they contributed to or limited the digital marketing effects on food-related attitudes and behaviours.

There were some limitations of this research that need to be noted. The majority of the participants in this research were middle-class, university students, and from regional or metropolitan areas from New South Wales (Australia). The non-representative convenience sample may limit the generalisability of the findings. Both the exposure experiment and the online survey studies attempted to include young adults from various SES but recruitment of young adults from lower socio-economic backgrounds was a challenge.

Although the sample size in the second study was estimated to have sufficient statistical power and achieved a moderate effect size (Chapter 5), the study ultimately included only a small sample (N=60), and thus limited the generalisability of the findings.

The questionnaire used in the cross-sectional study (Chapter 6) was not validated, although it was derived from previous studies that explored young people's views of digital marketing of unhealthy commodities (Critchlow et al. 2016) and young adults' view of energy drinks (Chapter 5) (Buchanan et al. 2017).

The content analysis study (Chapter 4) provided a snapshot of how energy drink marketers appealed to young people on the Internet. However, this only provided a small piece of the overall picture of digital marketing influences; for example, the use of smart phone devices to promote unhealthy food and beverage products was not captured in this research. Additionally, although the revealed strategies were likely to attune with young people's desires or aspirations, the age-specific effects could not be determined.

Lastly, the research used one beverage product category as the case study. Although energy drinks represent an unhealthy yet popular beverage product that is widely promoted on the Internet, the findings need to be interpreted with caution in relation to their possible application to other product categories.

7.7 Recommendations for future research

The limited representativeness of the study participants in this research provides opportunity for future research. Young adults from low SES, lower education levels, rural or remote areas, or different cultural backgrounds (i.e. race, ethnicity), as well as having different levels

of engagement with digital technologies, may provide different perceptions regarding the digital marketing of energy drinks and may have different patterns of energy drink use compared to the young adults who participated in this research.

This research investigated only the digital marketing impacts of one type of beverage product. Future research may consider examining the digital marketing effects on other food and beverage product categories.

Additionally, there is a lack of standardisation and consistency in measuring digital marketing exposures or engagements, as was identified in the literature review chapter (Chapter 2). The cross-sectional survey used in this research was not validated. Future research could extend this preliminary study to examine the digital marketing effects of a broader range of food and beverages and to develop a standardised tool to measure digital marketing exposure and engagement or using a range of metrics developed by the marketers to measure digital marketing success (Kerley 2017).

The second study of this research (Chapter 5) provided evidence to support the short-term effects of digital marketing on food-related attitudes and behaviours. To our knowledge, no study has examined the long-term effects of this form of marketing. Longitudinal studies that assess the impact of digital marketing exposure and engagement over time will contribute to the knowledge of this research field.

Future studies could also consider including the digital navigation software that stores online activities as one of the data collection tools. Incorporating this approach with go-along interviews, where participants navigate through the webpages while answering the interview

questions (Niland et al. 2017), may provide greater insights into how young adults engage with digital marketing.

As noted in Section 7.5, research gaps also exist in the intervention approaches to limit marketing of unhealthy food and beverages through digital platforms. Research that explores the views of key stakeholders (e.g. policy makers, consumer advocacy groups, educators, digital marketers and young people) with regard to varying approaches to manage and/or restrict digital marketing exposure and engagement, are needed. Future studies could also utilise the key findings of this research in intervention studies; for instance, building young adults' self-efficacy over digital marketing of unhealthy food or beverage products by modifying their attitudes, subjective norms about, and their PBC.

7.8 Significance of the research findings

The findings of this thesis have important implications to strengthen the research evidence that food marketing exerts impacts on young consumers, including young adults. The commercial marketing effects of unhealthy food and beverages that target young adults are of significant concern given that during this transitional life stage people are pursuing their own identity, making their own purchases and dietary choices, and are without parental guidance and support (Arnett 2004). This has opened up opportunities for food and beverage industries to connect with this age group and subsequently influence their food-related attitudes and behaviours. The public health field is yet to match this level of commercial influence with initiatives to support and build the consumer behaviour of young adults.

Public health researchers should consider as a priority the need to promulgate information regarding the use of, and to develop greater understanding of, the use of digital media to

market unhealthy food and beverages. The alarming rise of NCDs has been a public health concern in the past decades. The globalisation of unhealthy lifestyles, including excessive consumption of unhealthy food and beverages, has been identified as one of the leading risk factors of NCDs. The emergence and use of digital technologies further aggravates inactive lifestyles and creates more channels for marketers to promote their products.

This study has provided important new insights into the impacts of digital marketing. It found digital marketing to be a potentially more compelling form of marketing compared with other forms, such as television, print or in-store promotions. Based on the studies' findings, it could be concluded that digital marketing influences young adults' attitudes towards, intended purchase and consumption, as well as their actual energy drink consumption.

Strategies used by marketers to increase their influence were identified in this research. Marketers utilise the functions of digital media to 'seed' the marketing content through young adults' online social interactions with peers in order to enhance their interest regarding these products. Marketers also embed corporate social responsibility initiatives of the manufacturers within the companies' websites or SNS content. The effect of this is to reduce young adults' scepticism towards their products.

In addition, the research found that the three constructs of the TPB played significant roles in mediating the effects of digital marketing. This finding provided important insights for the development of future public health interventions and highlighted the potential avenues to limit the impacts of digital marketing.

Importantly, this research developed a conceptual framework (Figure 7.1) based on three social psychology theories to illustrate the processes of digital marketing and how it exerts impacts on an individual's intra-personal factors. Further exploration of the relevance of these theories in understanding digital marketing impacts is warranted. This framework has the potential to structure and inform future research in this field.

Finally, this research summarised the potential approaches to counter the effects of unhealthy food and beverages marketed through digital media (Figure 7.2). This can assist the public health researchers in understanding digital marketing and urge the regulators, policy makers, and practitioners to develop approaches to safeguard young consumers from unhealthy digital marketing.

7.9 Conclusion

Modern technologies afford an almost limitless and instantaneous ability for marketers to reach out to consumers around the world. This body of research, using energy drinks as an exemplar, identified that marketing of unhealthy food and beverages on the Internet is widespread and influence the so-called cognitively developed young adults. While the young adults were sceptical about explicit marketing content, they failed to recognise the content embedded in peers' online social interactions and the 'subtle' forms of marketing, such as the positioning of corporate social responsibility as marketing material.

Unhealthy beverages such as energy drinks are not considered part of a healthy diet. The significant association between digital marketing and energy drink use revealed in this research highlighted that greater attention needs to be directed to this form of marketing and its impacts on young adults. A number of potential approaches, including building young

adults' self-efficacy and promoting regulatory restrictions, may reduce their susceptibility to, and engagement with, the marketing of unhealthy food and beverages. As important first steps, the public health community needs to be better informed of the negative impacts of digital marketing on the overall food environment, understand the range of persuasive digital marketing strategies used by manufacturers of unhealthy food products, and consider approaches to ensure that the constraints considered as relevant to appropriately manage food and beverage advertising reflect the evolving digital environment.

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APPENDICES

Appendix A: The published systematic review

nutrients

MDPI

Review

The Effects of Digital Marketing of Unhealthy Commodities on Young People: A Systematic Review

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Abstract: The marketing of unhealthy commodities through traditional media is known to impact consumers' product attitudes and behaviors. Less is known about the impacts of digital marketing (online promotional activities), especially among young people who have a strong online presence. This review systematically assesses the relationship between digital marketing and young people's attitudes and behaviors towards unhealthy commodities. Literature was identified in June 2017 by searches in six electronic databases. Primary studies (both qualitative and quantitative) that examined the effect of digital marketing of unhealthy food or beverages, alcohol and tobacco products on young people's (12 to 30 years) attitudes, intended and actual consumption were reviewed. 28 relevant studies were identified. Significant detrimental effects of digital marketing on the intended use and actual consumption of unhealthy commodities were revealed in the majority of the included studies. Findings from the qualitative studies were summarized and these findings provided insights on how digital marketing exerts effects on young people. One of the key findings was that marketers used peer-to-peer transmission of messages on social networking sites (e.g., friends' likes and comments on Facebook) to blur the boundary between marketing contents and online peer activities. Digital marketing of unhealthy commodities is associated with young people's use and beliefs of these products. The effects of digital marketing varied between product types and peer endorsed marketing (earned media) may exert greater negative impacts than owned or paid media marketing.

Keywords: digital marketing; online marketing; unhealthy commodities; young people; consumption behaviors; systematic review

1. Introduction

Non-communicable diseases (NCDs) are the leading causes of death and disability across many nations [1]. Major modifiable risk factors for NCDs include the consumption of unhealthy commodities such as ultra-processed, energy-dense nutrient-poor (EDNP) food and beverages, tobacco and alcohol [2]. Commercial marketing of these unhealthy commodities propagates their use, where this marketing is ubiquitous, repetitive and reinforced across media platforms. Evidence of the effects on behaviors of marketing various unhealthy commodities, as summarized by previous reviews, has found a remarkable degree of consistency regarding the widespread and detrimental effects of these marketing efforts [3–9].

Most of the available literature that explores the effects of marketing unhealthy commodities focuses on traditional broadcast media, namely television [4,6,7]. Although television remains the most utilized promotional channel, evidence suggests that its dominance is waning [10]. Detailed expenditure data for unhealthy commodities marketing are not publicly accessible but what is

available indicates that the manufacturing food industry is shifting their marketing budgets from traditional media to digital media. In the USA, spending on children-directed television marketing has experienced a decline of 20% while spending on digital media marketing rose by 50% between 2006 and 2009 [10].

Digital marketing encompasses any promotional activities undertaken through websites, social networking sites (SNS), emails, mobile phone texts, applications (apps) and online games [11]. This form of marketing is well-regarded in the literature within marketing and advertising research fields for its ubiquity, interactivity and 24/7 availability [12]. There is a suggestion that digital marketing is even more impactful than traditional marketing due to its characteristic of peer endorsement and lack of explicit advertising cues presented in some forms of digital media [11], for instance, 'seeding' a message on SNS and transmitting this through online communities.

The vast majority of research that has been undertaken to understand the effects of commercial marketing of unhealthy commodities has focused on young children [4,6,7], whereas research on older adolescents and adult populations are relatively limited [3,9,13]. One review systematically assessed the evidence of experimental intervention studies of food and beverages promotion to adults (16 years and above) but could not draw a conclusive outcome from the sparse studies conducted on adults [13]. In two systematic reviews that summarized evidence from prospective cohort studies on alcohol promoted to adolescents and young adults through traditional media, marketing was linked to early onset of drinking [3] and current alcohol consumption [9]. Public health researchers have called for greater policy and research attention on the effect of marketing on behaviors and for this to be extended to adolescents and young adults due to the rising overweight and obesity rates [14,15] and the lack of regulations in restricting unhealthy commodities, particularly EDNP food and beverages, towards these age groups [15].

Adolescents and young adults have a strong online presence and growing purchase power and are viewed by digital marketers as a lucrative market segment [15,16]. Yet only a few studies have assessed the use of digital media to promote unhealthy commodities to these age groups by the food and beverages [15], tobacco [17] and alcohol [18] industries and these studies have only looked at one unhealthy commodity in isolation due to different research interests. There are parallels in the marketing techniques used between these different product categories and so collective review evidence of effects may be useful. The aims of this review were to: (i) systematically assess the findings from empirical studies that evaluate the association between digital marketing and young people's attitudes and behaviors towards unhealthy commodities; and (ii) collate findings to provide an overview of how this novel form of marketing exerts its influences on young people. This review will be valuable for the public health community and policymakers to assist their understandings of the contributions of digital marketing to the use of unhealthy commodities and the need for policy interventions, for example regulatory interventions to restrict this marketing and programs to counter the effects of unhealthy digital marketing.

2. Materials and Methods

This review is reported consistent with the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines [19]. The protocol was registered with the PROSPERO International Prospective Register of Systematic Review before commencing of data extraction [20] (see protocol registration number: CRD42017076682). A systematic literature search was conducted in June 2017 on databases including Business Source Complete, Emerald Insight, ProQuest Central, PsycINFO, Scopus and Web of Science for articles published between 1990 and 2017 and whose title, abstract and keywords matched the following Boolean search strings: (market* OR advert* OR promot*) AND (online OR internet OR web OR "social media" OR "social network" OR "new media" OR "online game" OR advergam*) AND ("young people" OR "young adults" OR "young generation" OR "university students" OR "college students" OR adolescents OR teenagers OR youths) AND NOT (child*) AND (food OR beverage OR drink OR soda OR cola OR alcohol OR tobacco OR cigarette).

The full record of search strings on Scopus is shown in Table 1. Additional searches for suitable studies were conducted on Google Scholar, websites and grey literature sources. Reference lists of the identified articles and key reviews were hand-searched for further studies.

Table 1. Search parameters for Systematic Review of the digital marketing effects on young people: Example on Scopus.

	Operator	Definition	Hits
1.	Title, Abstract, Keywords	market* OR advert* OR promot*	2,487,973
2.	Title, Abstract, Keywords	online OR internet OR web OR "social media" OR "social network" OR "new media" OR "online game" OR advergam*	1,156,990
3.	Title, Abstract, Keywords	"young people" OR "young adults" OR "young generation" OR "university students" OR "college students" OR adolescents OR teenagers OR youths	2,634,580
4.	Title, Abstract, Keywords	child*	2,898,753
5.	Title, Abstract, Keywords	food OR beverage OR drink OR soda OR cola OR alcohol OR tobacco OR cigarette	2,070,463
6.	Boolean operator	#1 AND #2 AND #3 AND NOT #4 AND #5	931
7.	Limit date range Limit language Limit document type	1990–2017EnglishArticle	780

Studies were included if they met the following criteria: (1) Primary studies published in peer-reviewed journals or on relevant websites; not reviews or commentaries; (2) Study participants were aged 12 to 30 years; studies with a sample of broader age range were only included if the target age group was analyzed separately. Australian Bureau of Statistics (ABS) identified adolescents and young adults aged 15–34 years as the biggest Internet users (98%) followed by adolescents aged under 15 years (97%) [21]. The age range of 12 to 30 years was selected since many studies have used 12 years as a starting year for adolescents and 30 years as a cut-off for young adults; (3) Study factors included any marketing or promotion of unhealthy commodities including food and beverages, tobacco and alcohol generated by the product industry using online platforms such as Internet, websites, social network sites (SNS), online games and emails. Studies that examined the marketing impact of digital media as well as traditional media were included if the effects of digital marketing were analyzed separately. Studies that examined the user-generated online contents were excluded; (4) Indicators of outcome included psychological measures such as perception and attitudes, purchase and consumption intentions, purchase and consumption behaviors (for the simplicity, hereby collectively referred to as "attitudes and behaviors"); and (5) Studies based on content analyses were excluded as outcome variables were often not examined in this type of study.

Title and abstract of the identified references were pre-screened for relevance by the lead reviewer (L.B.). Two independent reviewers (L.B., K.K.) then assessed the full-text articles in detail based on the exclusion criteria. When there were discrepancies between the two reviewers, a third reviewer (B.K.) was consulted. A consensus was then reached through discussion of evaluations. Data of the included studies were extracted and recorded in a tabulated summary by the lead reviewer. Details recorded in the template included date, location, participants' demographics, sample size, study aims, study designs, study factors, outcome measures, results and control variables. Overall association between the study factors and outcome measures were determined and categorized into: significant detrimental association (e.g., increased exposure enhanced unhealthy commodities use); significant beneficial association (e.g., increased exposure reduced unhealthy commodities use); association cannot be

determined; or inconsistent association (e.g., a mixture of detrimental, beneficial, or no association). The second reviewer (K.K.) verified the extractions.

Due to the heterogeneity of the study designs, study factors and outcome measures of the included studies (see Section 3), meta-analysis was deemed inappropriate and qualitative narrative synthesis was used to combine the overall findings of the reviewed studies. Quality appraisals were conducted by using the NIH (National Heart, Lung and Blood Institute, Bethesda, MD, USA) (cross-sectional, longitudinal and controlled intervention studies) or CASP (Critical Appraisal Skills Program) (qualitative studies) assessment tools [22–24]. Each tool can be generally divided into four domains: study setup, sample selection, assessment and data analysis. Each domain was rated good, fair or poor. Studies included in the review were appraised by the lead reviewer in consultation with the second and third reviewers.

3. Results

Database searches identified 2295 records, with 1206 records remaining after duplicates were removed. The primary screening excluded 1117 records; the remaining 89 full-text articles were assessed in detail and 24 met the inclusion criteria. An additional four studies were identified through the reference lists of the identified articles and grey literature sources. A total of 28 articles were included in this review (Figure 1).

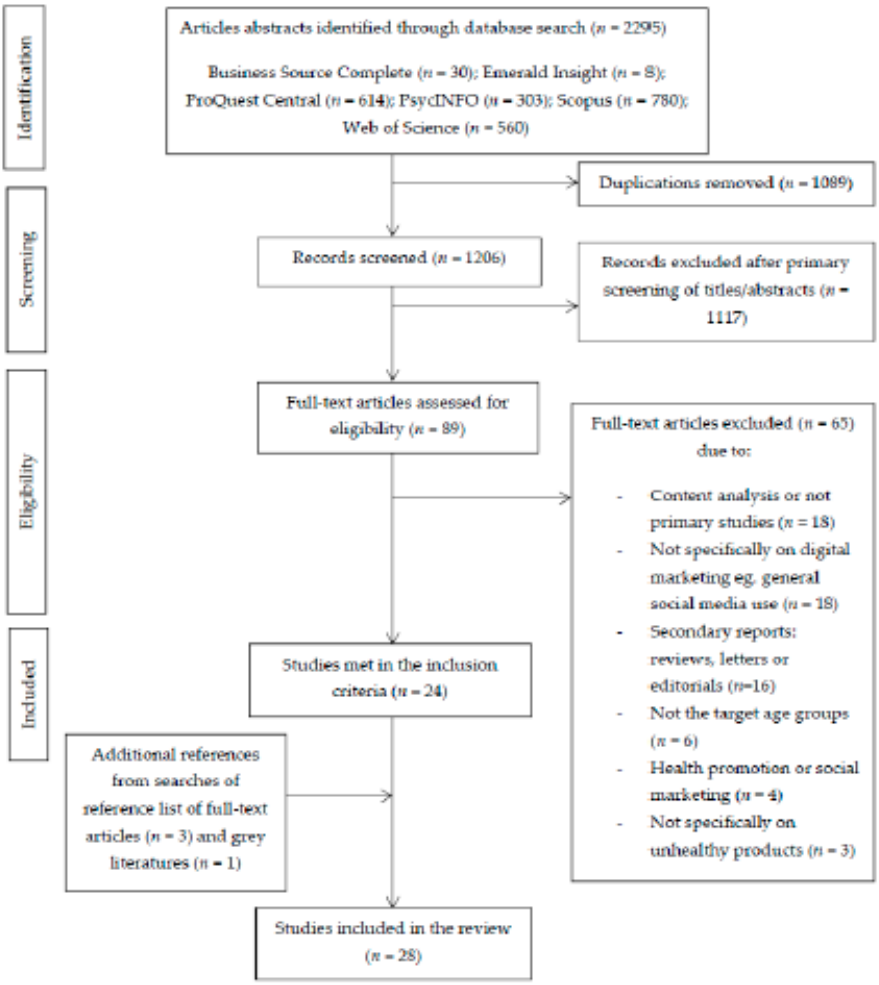

Figure 1. Flow chart of systematic review literature search.

The included 28 studies were published between 2001 and 2017 (Tables 2 and 3). The majority of the studies were conducted in economically developed countries (n = 24): Australia (n = 9) [25–33], USA (n = 5) [34–38], UK (n = 6) [39–44] and New Zealand (n = 3) [45–47]. One study included data collected from four countries—Germany, Italy, the Netherlands and Poland [48]. One study was conducted in each of Argentina [49], Brazil [50], Egypt [51] and Fiji [52]. The included studies reported data on 7 to 22,007 participants aged 12 to 30 years. Of these, six studies drew findings from state-wide or national samples [26,27,31,32,38,48]. The majority of the included studies examined marketing effects of alcohol (n = 18) [26,28–30,33,34,36,39,40,42–48,50,52], some were of tobacco or e-cigarettes (n = 7) [27,31,35,37,38,41,49] and a small number were on EDNP food or beverages (n = 3) [25,32,51].

Eleven of the included studies investigated the effects of unhealthy commodities marketed through digital media as well as traditional media [30–32,35,37–41,45,50]. Seventeen studies specifically examined marketing impacts of unhealthy commodities through digital communications [25–29,33,34,36,42–44,46–49,51,52]. Where percentage data were available, the reported prevalence of exposure to, or engagement with, digital marketing ranged from 5% to 88%; only four studies reported greater than 50% rates [26,28,39,48]. The outcomes of interest of the included studies were classified into three categories, with some studies measuring more than one outcome variable: attitudes (i.e. beliefs, perceptions of brands or products) (n = 10) [25,33,37,42–44,46,47,51], intended use (n = 9) [25–27,30,34,36,40,45,48] and current use (n = 17) [26–32,35,36,38–41,45,48–50] of unhealthy commodities.

It was difficult to quantify the volume of studies that found a detrimental association between digital marketing and attitudes or behaviors given that most of the included studies examined more than one form of digital marketing or outcome measure and mixed findings were found in some. Inconsistency of the direction of associations were found in eight studies [27,29,30,34,36,37,45,49] but all studies found at least one significant detrimental association between the examined study factors and outcome measures. Among the rest of the studies, nine studies found consistent significant detrimental associations [25,26,28,32,35,38,40,41,46], one study found consistent significant beneficial associations [31] and associations could not be determined in three studies [32,41,50] since regression analyses were not performed although descriptive data (e.g., percentage of exposure rate) were used to suggest the relationship (Table 2). The effects of digital marketing are therefore discussed by three outcomes of interest categories in the following sections.

Detrimental effects on young people's attitudes towards unhealthy commodities or brands were demonstrated in two quantitative studies [25,37] and supported by five qualitative studies [33,42,43,46,47] (Tables 2 and 3). One study found that participants' interests in energy drinks was enhanced by the social corporate responsibility efforts and masculine images created by the energy drinks brands after being exposed to the brands' websites and SNS [25]. Another study linked e-cigarette advertisements on the Internet to lower perceived harm and greater acceptability of these products among university students [37]. Association in one study cannot be determined given that only descriptive analyses were conducted. However, this study reported that digital alcohol marketing was perceived by their focus group participants to have improved mood and confidence among young people and young people preferred marketing contents on Facebook that seemed 'user-generated' or 'subtle' in appearance [33].

The qualitative studies reported that young people were skeptical towards the advertisements on sidebars (Facebook) or brand-sponsored advertisements [43,46] but they did not necessarily view their engagement with brand-related contents on SNS (i.e., "liking" or "sharing") as a form of marketing, especially when these were shared by their peers [42,46,47]. Two studies also revealed the social acceptability to be seen consuming certain alcohol brands on SNS as these brands were linked to desired masculinity, femininity and cultural images [42,46].

Table 2. Characteristics and results of the included quantitative studies.

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Alhabash et al. (2015)	University students from introductory classes, mean age 21 years $n = 379$ (USA)	To examine the effects of viral behavioral intentions (intentions to like, share and comment on) for status updates and display advertisements on social media users' intentions to consume alcohol	Experimental Design: 2 (likes: low vs. high) × 2 (shares: low vs. high) × (display ad type: alcohol ad vs. anti-binge drinking Public Service Announcement (PSA) vs. local bank) × 6 (status update repetitions) (Controlled intervention study)	Likes and shares on Facebook (Objectively measured)	Attitudes and viral behavioral intentions towards the display advertisements and status updates Intention to consume alcohol (Alcohol) (Self-reported)	Attitude towards status updates ($B = 0.2$, $t = 4.5$, $p < 0.00$) and viral behavioral intentions towards status updates ($B = 0.5$, $t = 6.6$, $p < 0.00$) positively predicted alcohol consumption intention. Attitudes towards ads display ($B = -0.1$, $t = -1.6$, ns) and viral behavioral intentions towards ads display ($B = 0.1$, $t = 1.9$, $p = 0.06$) did not predict alcohol consumption intention. No variables were adjusted. (Inconsistent association)
Buchanan et al. (2017)	Young adults aged 18–24 years $n = 60$ (Australia)	To assess the impact of online marketing on young adults' perception and consumption behaviors, using energy drinks as an example	Pre-test/post-test experimental trial, followed by semi-structured interview (Controlled intervention study)	Experimental group: exposure to two energy drink brands website and social media sites (Objectively measured)	Attitudes towards, purchase intention and consumption intention of, the two exposed energy drinks brands and energy drinks products in general (Energy drinks) (Self-reported)	Exposure to energy drinks online marketing content improved young adults' attitudes towards ($t(50) = -4.5$, $p = 0.00$) and increased consumption intention of ($\chi^2(1) = 7.9$, $p = 0.01$), energy drinks products. No variables were adjusted. (Significant detrimental association)
Carrotte et al. (2016)	Young people aged 15–29 years $n = 1001$ (Australia)	To explore the relationship between alcohol marketing on social media and alcohol consumption among young people	Online survey (Cross-sectional study)	Alcohol marketing social media use "like/follow pages on Facebook, Instagram or Twitter" (Self-reported)	Alcohol consumption (number of standard drinks consumed on a typical day of drinking and risky single occasion drinking) age of initiation of drinking (Alcohol) (Self-reported)	Liking or following any alcohol marketing page was significantly associated with early age (10–14 years) of first alcohol consumption (AOR = 2.2, 95% CI = 1.6–3.0). Higher AUDIT-C (more risky alcohol consumption) were associated with liking or following alcohol marketing pages (AOR = 2.1, 95% CI = 1.5–2.8). Adjusted variables: Gender, age, education, location, sexuality, country of birth, recreational spending per week, recent mental health problems, ever used illegal drugs, age at first alcohol consumption (Significant detrimental association)
Critchlow et al. (2016)	Young people aged 18–25 years $n = 405$ (UK)	To examine the relationship between awareness of traditional, digital marketing and young people's frequency of high episodic drinking (HED)	Survey (Cross-sectional study)	Awareness of and participation with 11 digital marketing channels,' awareness of nine traditional marketing channels (Self-reported)	Frequency of high episodic drinking (HED) (Alcohol) (Self-reported)	Participation with digital marketing increased the frequency of HED ($B = 0.2$, $p < 0.00$). Adjusted: Awareness of traditional alcohol marketing (Significant detrimental association)

Table 2. *Cont.*

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
De Bruijn et al. (2016)	European youths, mean age 14 years $n = 9032$ (Germany, Italy, Netherlands, Poland)	To examine the exposure to alcohol marketing through digital media and its association with initiation of alcohol use, recent binge drinking and volume of alcohol consumption	Survey (Cross-sectional study)	Frequency of exposure to alcohol marketing in online media. (Self-reported)	Alcohol use (Alcohol) (Self-reported)	Exposure to online alcohol marketing was linked to an increase likelihood of beginning alcohol use and binge drinking in the past 30 days. The association was the strongest for: looked at a website for alcohol brands (onset of drinking AOR = 1.1, 95% CI = 1.1–1.2; past 30 days binge drinking AOR = 1.11, 95% CI = 1.1–1.2) downloaded alcohol-branded screensaver (onset of drinking AOR = 1.1, 95% CI = 1.1–1.2; past 30 days binge drinking AOR = 1.1, 95% CI = 1.1–1.2). Exposure to online alcohol ad increased the odds of being a drinker (AOR = 1.3, 95% CI = 1.2–1.4) and binge drinking (AOR = 1.24, 95% CI = 1.2–1.3) Adjusted: gender, smoking, age, education level, religious constraints against alcohol, alcohol use peers, alcohol use mother, peer permission to drink, maternal permission to drink. (Significant detrimental association)
Depue et al. (2015)	Connecticut residents aged 18–24 years $n = 200$ (USA)	To assess the association between smoking behavior and the exposure to mass media depictions of smoking on social networking websites	Telephone surveys (wave 1 and wave 2–5 months apart) (Longitudinal study)	See tobacco use on TV, in movies and in social media content such as Facebook or MySpace (Self-reported)	Cigarette use in the past 30 days (Tobacco) (Self-reported)	Time 1 social media tobacco use was a significant predictor of smoking at Time 2 (OR = 1.6, $p < 0.05$). Social media tobacco use had a moderate correlation to both time ($r = 0.2$, $p < 0.05$) and time 2 ($r = 0.2$, $p < 0.05$) Not adjusted: sex, race, friends and family tobacco use, sensation-seeking Social media depictions of tobacco use were associated with future smoking tendency (Significant detrimental association)
Dunlop et al. (2016)	Young people in two Australian states aged 12–24 years $n = 8820$ (Australia)	To assess the exposure of young Australians to online tobacco advertising and promotion and to determine whether exposure has changed in recent year in relation to the changes in tobacco promotion opportunities	Telephone surveys (four waves) (Repeat cross-sectional study)	Exposure to Internet-based tobacco advertising and branding in the past month (Self-reported)	Smoking behaviors: Current smoking (never-smokers; experimenters; current smokers; ex-smokers), smoking susceptibility (Tobacco) (Self-reported)	Current or ex-smokers had lower odds of being exposed to Internet-based advertising than experimenters or never-smokers (AOR = 0.4, 95% CI = 0.3–0.5) Non-smokers aged 12–17 years, exposure to online advertising and branding (OR = 1.3, 95% CI = 1.1–1.6) or branding alone (OR = 1.4, 95% CI = 1.1–1.8) increased their susceptibility to smoking Adjusted: demographic characteristics, year of Interview, average daily Internet use, SES status, smoking exposures (friends, household) (Inconsistent association)

Table 2. *Cont.*

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Gordon et al. (2011)	Students attending schools in the West of Scotland, aged 12–14 years $n = 920$ (UK)	To examine the cumulative impact of alcohol marketing communications on adolescents' drinking behaviors	Survey (Cross-sectional study)	Awareness, appreciation and involvement with various forms of alcohol marketing including digital marketing, as measured by interview-administered questionnaire (Self-reported)	Drinking status, future drinking intentions, age of initiation of drinking, as measured by self-completion questionnaire (Alcohol) (Self-reported)	Participation in electronic alcohol marketing increased the likelihood of being a drinker (OR = 4.0, 95% CI = 1.5–10.8) and associated with greater intention to drink alcohol in the next year ($B = 0.1$, $p < 0.01$) Adjusted: perceived parental attitudes towards drinking and alcohol consumptions, perceived siblings and peers' attitudes towards drinking and alcohol consumption, liking of adverts in general and liking of alcohol adverts in particular, age (Significant detrimental association)
Hoffman et al. (2014)	Public and private university students, mean age 21.4 years $n = 637$ (USA)	To examine the relationship between college students' use of social media, their exposure to alcohol marketing messages through social media and their alcohol-related beliefs and behaviors	Online survey (Cross-sectional study)	Engage with alcohol related marketing on the websites and social media sites. (Self-reported)	Drinking behaviors: problem drinking as measured by problem-drinking index, use in past 30 days, use in 1 occasion. (Alcohol) (Self-reported)	The use of alcohol-marketing applications on social media predicted: more drinking problems ($B = 0.3$, $p < 0.00$), more frequent alcohol use in past 30 days ($B = 0.2$, $p < 0.00$), heavier consumption in a single occasion ($B = 0.2$, $p < 0.00$) Adjusted: private or public university affiliation, demographic variables included sex, age, reported family income, reported grades in school, expectations for educational attainment, year in college (Significant detrimental association)
Jones and Magee (2011)	Adolescents aged 12–17 years $n = 1113$ (Australia)	To investigate the exposure level to different types of alcohol advertising and to examine the association between exposure to advertising and alcohol consumption	Survey (Cross-sectional study)	Exposure to alcohol advertisement across eight media including Internet (Self-reported)	Alcohol consumption behaviors (initiation, recent consumption in the past 4 weeks and frequency of consumption in the previous 12 months) (Alcohol) (Self-reported)	Exposure to Internet alcohol advertising increased the likelihood of recent alcohol consumption (AOR = 1.4, 95% CI = 1.0–1.8) but not the alcohol initiation (AOR = 1.3, 95% CI = 0.9–1.7) or alcohol consumption in the past 12 months (AOR = 1.0, 95% CI = 0.7–1.3) Adjusted: age, gender, country of birth, religion, mother's alcohol consumption, father's alcohol consumption, siblings' alcohol consumption, friends' alcohol consumption, source of recruitment. (Inconsistent association)
Jones et al. (2016)	Young people aged 16–24 years $n = 283$ (Australia)	To examine the association between Facebook users' interactions with alcohol brands and alcohol consumption	Online survey (Cross-sectional study)	Recalled exposure to alcohol marketing on Facebook, interaction with alcohol brands on Facebook (e.g., liking, commenting) (Self-reported)	Alcohol use amount (1–2 drinks, 3–4 drinks and more than 5 drinks), alcohol use frequency, binge drinking frequency as measured by AUDIT-C. (Alcohol) (Self-reported)	Respondents who had ever liked, posted, commented or uploaded/tagged alcohol brands on Facebook increased the alcohol use frequency (OR = 2.0, 95% CI = 1.2–3.5); increased alcohol amount use (OR = 3.7, 95% CI = 2.1–6.7), increased binge drinking frequency (OR = 2.4, 95% CI = 1.4–4.2) No association was found between the quantity of alcohol consumed and having visited an alcohol's Facebook page, visited an alcohol website by clicking the link on Facebook, or viewed an event created/sponsored by an alcohol company Adjusted: socio-demographic backgrounds (Inconsistent association)

Table 2. *Cont.*

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Lin et al. (2012)	Students aged 13–14 years $n = 2538$ (New Zealand)	To examine to association between awareness and engagement with a range of alcohol marketing channels and drinking behaviors	Computer assisted telephone interview (Cross-sectional study)	Awareness of and engagement with 15 of alcohol marketing channels including web based marketing, as measured by interview-administered questionnaire (Self-reported)	Drinking status, drinking frequency, drinking quantity and future drinking intentions, as measured by interview-administered questionnaire (Alcohol) (Self-reported)	Those engaged with web-based alcohol marketing were: More likely to be drinkers (OR = 1.9, 95% CI = 1.2–3.0) More likely to have drunk alcohol in the past 12 months (OR = 2.0, 95% CI = 1.2–3.2), Less likely to drink alcohol on a typical occasion (OR = 0.7, 95% CI = 0.5–1.0) Not significantly related to drinking intention (OR = 1.0, 95% CI = 0.4–2.2) or drinking frequency (OR = 0.9, 95% CI = 0.6–1.2) Adjusted: age, gender, ethnicity, drinking behaviors and perceived drinking approval of parents, siblings and friends (Inconsistent association)
MacFadyen et al. (2001)	Young people aged 15 and 16 years $n = 629$ (UK)	To examine the association between young people's awareness of and involvement with tobacco marketing and their smoking behavior	Survey (Cross-sectional study)	Exposure and involvement to all forms of tobacco marketing activities including Internet sites (Self-reported)	Smoking status (non-smoker; tried smoking; current smoker) (Tobacco) (Self-reported)	There was a low number of participants (8%) who were aware of the Internet sites for cigarettes or smoking and their smoking status were not significantly different ($p = 0.36$). Digital marketing exposure and involvement variables were not included in the regression models. Adjusted: gender, age, friends' smoking, sibling's smoking, mother's smoking and father's smoking, socioeconomic group, marital status of parents, future education intentions and parental presence during interviews (Association cannot be determined)
McClure et al. (2016)	Youths aged 15–20 years $n = 2012$ (USA)	To examine the longitudinal association between Internet alcohol marketing engagement and alcohol use transitions among youth	Surveys were conducted at two time points (1 year apart) (Longitudinal study)	Internet alcohol marketing receptivity: exposure to alcohol advertising on the Internet, visiting alcohol brand websites, being an online alcohol brand fan (Self-reported)	Ever drinking and binge drinking (6 or more drinks per occasion) (Alcohol) (Self-reported)	Internet alcohol marketing receptivity increased the likelihood of initiating binge drinking, the higher the receptivity score, the greater the impact (score 1: OR = 1.8, 95% CI = 1.1–2.8; score 2: OR = 2.2, 95% CI = 1.1–4.4) However, Internet alcohol marketing was not associated with the initiation of ever drinking (score 1: OR = 1.2, 95% CI = 0.8–1.9; score 2: OR = 1.1, 95% CI = 0.3–3.8, ns) Adjusted: baseline drinking status, socio-demographics, peer drinking, parent drinking, general time spent on the Internet, sensation seeking (Inconsistent association)

Table 2. *Cont.*

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Perez et al. (2012)	Adolescents and young adults aged 12 to 24 years n = 1000 (Australia)	To examine the level of exposure of New South Wales (NSW) adolescents and young adults to the promotion of tobacco through point-of-sale, Internet, entertainment media and venues and to identify young people who are at risk of exposure	Telephone survey (Cross-sectional study)	Perceived exposure to promotion or advertising of tobacco in the last month through various forms of marketing methods including Internet (Self-reported)	Smoking status (current smokers, ex-smokers, experimenters, non-smokers) and susceptibility to smoking (susceptible non-smokers, non-susceptible non-smokers) (Tobacco) (Self-reported)	Participants who had ever smoke had lower odds of seeing cigarette brands, tobacco company names or logos on the Internet (OR = 0.6, 95% CI = 0.4–1.0) than those who never smoke. Adjusted: age, sex, Socio-economic status (SES), income, household smoking, friends smoking, Internet use (Significant beneficial association)
Pinsky et al. (2010)	Subjects aged 14–25 years n= 1091 (Brazil)	To explore Brazilian adolescents and young adults' exposure to alcohol advertising and to assess the relationship between the exposure to heavy alcohol consumption	Face-to-face interviews but quantitative questions (Cross-sectional study)	Perceived exposure to alcohol marketing in different media including Internet (Self-reported)	Alcohol consumption: high intensity drinkers (drink at least once a week) vs. low intensity drinkers (drink less than once a week) (Alcohol) (Self-reported)	91.6% declared they have not seen alcohol advertising on the Internet or visited a website related to alcohol beverages. Exposure to alcohol Internet sites was not included in the logistic models, due to low incidence of reported exposure Adjusted: intensity of alcohol consumption, sociodemographic backgrounds (Association cannot be determined)
Reinhold et al. (2017)	Students at a large Midwestern university aged 18–24 years n = 5983 (USA)	To explore young adults' perceptions of harm and acceptability of the use of e-cigarette and to examine whether e-cigarette advertising has an effect on perception of harm and acceptability of use	Online survey (Cross-sectional study)	E-cigarette advertising exposure through different media channels including Internet (Self-reported)	Lifetime e-cigarette use, perception of harm, addictiveness and acceptability of e-cigarette use in places (E-cigarette) (Self-reported)	Having seen an advertisement on the Internet was significantly associated with lower perceived harm of e-cigarette use (AOR = 1.2, 95% CI = 1.1–1.3) and also acceptability of e-cigarette use in various locations (all $p < 0.00$) Having seen advertisement on the Internet was not associated with the lower perceived addictiveness of e-cigarette (AOR = 1.1, 95% CI = 1.0–1.2, ns) Adjusted: maternal smoking status, smoking history, gender, race, exposure to advertising on other platforms (TV, magazine) (Inconsistent association)
Salgado et al. (2014)	Current or recently graduated medical students aged 20–30 years n = 1659 (Argentina)	To examine the effects of tobacco industry Internet marketing strategies on young adults	Survey (Cross-sectional study)	Frequency of access to tobacco website (from "once a day or more" to "once a month or less"). (Self-reported)	Ever smoke, never smoke, current smoker, former smoker (Tobacco) (Self-reported)	Former or current smokers were more likely to have accessed a tobacco brand website at least once (AOR = 2.5, 95% CI = 1.4–4.2; AOR = 8.1, 95% CI = 4.7–14.2, respectively) Current smokers were less likely to report having seen a tobacco advertisement on the Internet (AOR = 0.6, 95%CI = 0.5–0.8) Adjusted: age, daily use of Internet, received tobacco marketing promotion, used tobacco marketing promotion (Inconsistent association)

Table 2. *Cont.*

Author (Date)	Population (Country)	Study Aims	Data Collection (Study Design)	Study Factor	Outcome Measure	Results Control Variables (Overall Association)
Scully et al. (2012)	Secondary students aged 12–17 years n = 12,188 (Australia)	To determine the associations between exposure to various types of food marketing and adolescents' food choices and food consumption	Online survey (Cross-sectional study)	Various types of food marketing exposure including Internet (Self-reported)	Food choices, eating behaviors- frequency of consumption of fast food, sugary drinks and sweet snacks (Energy-dense and nutrient poor (EDNP) foods) (Self-reported)	Exposure to the digital food marketing increased the odds: To consume fast food one exposure source (OR = 1.2, 95% CI = 1.1–1.4) two exposure sources (OR = 2.3, 95% CI = 1.9–2.7) To consume sugary drinks two exposure sources (OR = 1.3, 95% CI = 1.1–1.6) To consume salty snacks two exposure sources (OR = 1.3, 95% CI = 1.1–1.5) Adjusted: gender, school year, geographic location of residence, socio-economic position (SEP), body mass index (BMI), school level (Significant detrimental association)
Singh et al. (2016)	Middle and high school students grades 6 to 12 (12–18 years) n = 22007 (USA)	To examine the association between e-cigarette advertising exposure (four sorts including Internet) and current e-cigarette use among US youth	Survey (Cross-sectional study)	Exposure to e-cigarette advertisement on Internet, newspaper/magazines, in retail stores, in TV/movies (Self-reported)	Current cigarette use (in the past 30 days) (E-cigarette) (Self-reported)	Among middle school students, greater exposure to e-cigarette Internet advertising increased the odds of being current e-cigarette users (most of the time/always AOR = 2.9, 95% CI = 1.9–4.5) Among high school students, greater exposure to e-cigarette Internet advertising increased the odds of being current e-cigarette users (most of the time/always AOR = 2.0, 95% CI = 1.7–2.5) Adjusted: gender, ethnicity, grade, other tobacco use (Significant detrimental association)
Weaver et al. (2016)	Young people aged 16–29 years n = 172 (Australia)	To investigate young people's perception of alcohol advertising on Facebook and to investigate the perceived compliance of these advertising with the Alcohol Beverages Advertising Code (ABAC)	Focused group discussion (to inform development of online survey) Online survey (Cross-sectional study)	Exposed to six popular Australian alcohol brands' Facebook pages (Self-reported)	Perception and interpretation of specific alcohol-branded marketing on Facebook, as measured by open-ended questions (with and without prompts). Drinking behaviors (Alcohol) (Self-reported—a mixture of quantitative and qualitative findings)	The focused group discussion revealed that participants preferred alcohol advertising that was 'user-generated', 'casual' and 'subtle' in appearance as it gives the impression that it was created by a 'real person' Association with success was also the most frequently reported message, for example, 'drinking is a social event and aids in the betterment of your social status' With prompts, participants reported that alcohol advertising made them feel more relax (67%), improved mood (65%), feel more social and outgoing (57%) and confident (49%) Measured but not adjusted: age, sex, education levels, favorite type of alcohol (Association cannot be determined)

PSA: Public Service Announcement; *B*: Standardized regression coefficients; *p*: Level of marginal significance; AOR: Adjusted odds ratio; CI: Confidence Interval; SES: Socio-economic status.

Table 3. Characteristics and results of the included qualitative studies.

No.	Author (Date)	Population (Country)	Study Aim (Product)	Data Collection	Results
1	Atkinson et al. (2017)	Young people aged 16–21 years $n = 70$ (UK)	To analyze the use and contents of alcohol marketing on the social network sites (SNS) and to explore young people's perspectives and experiences on alcohol marketing on SNS (Alcohol)	Stage 1: Content analysis of five alcohol brands' interaction with users on social networking sites; both brand- and user-generated contents over 1-month period Stage 2: Fourteen semi-structured interviews with peer groups of young people	Alcohol industry used social networking site particularly Facebook to engage consumers Branding of alcohol appealed young people. The social acceptability of consuming certain drinks and brands and being 'seen' drinking these on SNS were influenced by the connotations of masculinity, femininity and maturity Influence of SNS marketing on young people was mediated through their peers' online activities- engagement with alcohol on SNS reported to be done through young people's news feed as a result of their friend's interaction or through third party content (e.g., music and sporting events)
2	Gaber and Wright (2014)	Young people aged 17–29 years $n = 40$ (Egypt)	To explore the factors that influence young Egyptians' attitudes towards fast-food advertising on Facebook. (Fast-food)	Focus groups Content analysis	Most of the participants had positive attitudes towards the advertising on Facebook and believed that Facebook advertising is informative and credible Participants preferred Facebook advertising over web advertisements that appear pop up causing a big amount of inconvenience and interruption Having friends who also liked or commented on the Fast food Facebook pages increased the likelihood of consumers clicked on the advertisement or tried the brands
3	Lyons et al. (2015)	18–25 years old young people $n = 141$ (focus group discussion) $n = 23$ (individual interviews) (New Zealand)	To use an innovative qualitative methodology to explore the role of social networking site in drinking cultures and alcohol consumption practices among young adults(Alcohol)	Stage 1: Focus group discussion Stage 2: Individual interviews with Internet-enabled laptop (digital navigation software to store all online activities) Stage 3: Analysis of a database of web-based materials that were mentioned or shown by participants in Stage 1 and 2	Alcohol companies use social media to enhance identity displays; participants actively engaged with these marketing initiatives with many highlighted that alcohol brands and pages were integral part of their online identities; allowed them to present their tastes and preferences and socially interacted with the other Facebook users by sharing amusing alcohol-related content generated by alcohol companies Participants do not necessarily view alcohol product pages and promotions on Facebook as advertising; alcohol marketing on Facebook involved Facebook friend relationships, that is, appear in group links, news feeds and status updates which are the in the same manner as friends' postings
4	Moraes et al. (2014)	Young adults aged 18 to 24 years $n = 15$ (UK)	To explore the use of Facebook to promote alcohol use among young people (Alcohol)	Focus group Netnographic study (apply the ethnographic research methods to study the cultures and communities that emerged through computer-mediated communications)	Facebook was used as a tool by alcohol brands and nightclub to communicate, co-produce and co-generate alcohol-related contents with young people that encourages alcohol use Wall comments, drinking-related group memberships, events, photographs and other social communications on Facebook normalized alcohol consumption among young people The events application was identified as one of the most valued Facebook features. For instance, by sending emails to users through events section, Vodka-Energy not only advertised their parties, they also promoted their sites and alcohol deals

Table 3. *Cont.*

No.	Author (Date)	Population (Country)	Study Aim (Product)	Data Collection	Results
5	Niland et al. (2017)	Young adults aged 18–25 years $n = 7$ (New Zealand)	To examine young adults' interactions with alcohol marketing from within their own social networking practices and to examine participants' meanings and understandings of the ways in which commercial alcohol interests interacted with their own online practices. (Alcohol)	Go-along interviews- participants accessed and navigated through their Facebook accounts and took the researcher on a "tour" showing and elaborating their social networking practices (data screen- capture software to track participants' online navigation and audio-visual recording of the conversation and non-verbal behaviors)	All participants viewed Facebook advertising as the sponsored sidebar ads on their Newsfeed pages, participants did not interpret 'liking' alcohol-related content or alcohol venue page photos and activities as a form of marketing Alcohol online marketing embedded in friendship endorsements and invitations makes the presence of Facebook alcohol marketing obscured since it was simply part of routine online friendship activities. Alcohol marketing on venue pages was not viewed as alcohol marketing but as prompts for friends to drink together Online marketing was explicitly employed by participants as funny user-generated content to share with friends instead of marketing contents
6	Purves et al. (2015)	14–17 years young people $n = 48$ (UK)	To explore the ways that alcohol marketers engage with consumers on the social media sites (Alcohol)	Content analysis by netnographic approaches Focus groups (single sex friendship groups)	Brand communicates their personality through social networking sites. Brand preference indicated the characteristics of young people. For example, males and females may prefer different alcohol brands Participants in the focus group reported seeing large volume of alcohol products marketing on the social networking sites and these were viewed as an inevitable daily content of social networking sites. Participants also reported to be exposed to these marketing contents due to their friends 'liked' or 're-tweeted' posts from alcohol brands
7	Waqa et al. (2015)	Students aged 14–17 years $n = 30$ (Fiji)	To explore Fijian students' view on tobacco and tobacco-related media depictions to gain insight into the drivers of smoking uptake and for potential direction for prevention intervention. (Tobacco)	In-depth interviews	Internet was identified by the young Fijians as an important source of information about tobacco promotion that persuade young people to smoke via repeat screenings and interactive applications and platforms Tobacco related media depictions on the Internet for example celebrity smoking images was viewed by participants as sending the negative messages to young people. Media linked tobacco use to "becoming famous"

Detrimental effects on young people's intention to use the unhealthy commodities were demonstrated in seven out of the nine studies that included intended consumption as outcome measure [25–27,30,34,40,48] (Table 2). Among the studies that found significant detrimental associations, five studies were on alcohol [26,30,34,40,48], one on tobacco [27] and one on energy drinks [25]. Two studies did not find any significant association between digital marketing and consumption intention [36,45].

Detrimental effects on young people's current use of unhealthy commodities were found in 11 out of the 17 studies that included current consumption as outcome measure (Table 2). Among the 11 studies that found significant detrimental association, eight were on alcohol [26,28,29,36,39,40,45,48], two were on tobacco [35,38] and one was on EDNP food [32]. Four studies found beneficial effects of digital marketing on current use of tobacco ($n = 3$) [27,31,49] and alcohol ($n = 1$) [30] products, meaning that exposure to digital marketing was associated with lower current use. Associations in two studies could not be concluded due to the very low reported digital marketing exposure and engagement that led to the exclusion of digital marketing variables in the regression models [41,50].

Literature Appraisal

The majority of the studies were cross-sectional studies ($n = 17$) [26–33,37–41,45,47–50], the remainder were longitudinal studies ($n = 2$) [35,36], experimental studies, ($n = 2$) [25,34] and qualitative studies ($n = 7$) [42–44,46,47,51,52]. One qualitative study was reported as a short article and it was not possible to obtain further data, so this study was not appraised in this review [44].

In the study setup domain for critical appraisal, other than the longitudinal and qualitative studies, all other studies were rated as good other than one experimental study which did not describe randomization and concealment of treatment allocation [34]. Most of the included studies were rated as good in the sample selection domain, however 10 of the cross-sectional studies did not report the participation rate. In the assessment domain, the two experimental studies that objectively measured the study factors (i.e., exposure to digital marketing) were rated as good. The majority of the cross-sectional studies were rated as fair since most of the data were self-reported by the participants. Only one of the two longitudinal studies reported the follow-up rate (62%) [36]. Most of the qualitative studies were rated as good in the assessment domain by adopting at least two methodologies for data collection. Of note, researchers in two studies used "go-along interviews" and digital navigation software to store the participants' online activities that included where they navigated through the sites [46,47]. In the data analysis domain, none of the cross-sectional studies justified their sample sizes. All studies controlled for potential covariates in their analyses including demographic variables, household and peers' alcohol or tobacco use and psychological aspects such as sensation-seeking.

4. Discussion

This study systematically reviewed evidence regarding the marketing effects of unhealthy commodities promoted through digital platforms on young people's attitudes and behaviors. The results indicated a link between digital marketing and young people's attitudes towards and intended and current use of a range of unhealthy commodities including alcohol, tobacco and EDNP food or beverages. However, a definitive relationship could not be determined due to the heterogeneity of the study designs, study factors and outcome measures employed by the included studies. Our findings also suggested that the effects of digital marketing vary across the investigated commodities and according to the nature of the exposed digital marketing activities.

Overall, current evidence regarding the effects of digital marketing of unhealthy products highlighted its detrimental impacts, through improving attitudes towards (67% = 2/3 studies), enhancing intention to use (78% = 7/9 studies) and current use of (65% = 11/17 studies) these commodities. These effects seem to be the most consistent among studies on alcohol products, where five out of the seven studies found digital marketing increased intention to drink alcohol, while eight out of 10 studies found digital marketing increased actual alcohol consumption. Our findings are in

accordance with the findings from an earlier systematic review that specifically focused on the impacts of digital alcohol marketing, which found that alcohol-related content on the Internet negatively influenced young people's drinking behaviors [5].

The effects of digital marketing were reported to vary between products being advertised. While there was a fairly consistent association between digital alcohol marketing and young people's behaviors, inconsistent findings were found in the tobacco studies. Among the five studies on tobacco products that investigated digital marketing impact on current tobacco use, two of them found non-smokers were more likely to notice tobacco marketing contents on the Internet [27,31], which was completely opposite to the other two tobacco studies that found smokers were more likely to be exposed to digital marketing of tobacco [35] and e-cigarettes [38]. One potential explanation for this could be the perceived images of these products among young people. The tobacco studies that found non-smokers were more likely to have reported seeing digital tobacco marketing were both conducted in Australia, where strong public health controls for tobacco products may have created unappealing images for these products [53,54] and people who disliked these products (non-smokers) might have paid more attention to the advertisements than current smokers. On the other hand, alcohol brands were marketed using themes of success, fun, masculinity and femininity; these were the images desired by and reported to be socially acceptable among young people to be seen with alcohol products on the SNS [42,46].

Differential impacts from the various digital marketing approaches were also noted. These marketing approaches were broadly categorized into three forms: (i) earned media where the marketing activities were peer endorsed (e.g., likes and comments on SNS by online communities); (ii) owned media where the marketing activities were generated by the company on the channels that it controlled (e.g., posts from company on their brand page); and (iii) paid media activities where the company paid advertisers to create marketing activities (e.g., display advertising) [55]. Significant detrimental effects were demonstrated in two studies [29,34] from the earned media activities but not the owned or paid media activities of digital marketing. An experimental study in which participants were exposed to Facebook marketing of a specific alcohol brand found that participants' intended alcohol use was associated with the exposure to Facebook status updates (i.e., like, share, comment) (earned media). However, no significant effects on the intended alcohol use were found from the exposure to the online display advertisements on Facebook (paid media) [34]. Another study found participants' engagement with Facebook alcohol marketing (liked, posted, commented or uploaded photos) (earned media) predicted alcohol use but no association was found with exposure to alcohol websites (owned media) [29].

Different impacts of the features (interactive and static) of the marketing activities can be explained by the findings from the included qualitative studies. Earned (interactive) media marketing activities, such as online peer networking especially through SNS, may blur the lines between commercial and user-generated content. It was reported in two studies that while participants denied having actively engaged with the digital marketing activities, many of them reported to have had shared amusing product-related contents with their peers on SNS [46,47]. The influential power of interactive marketing strategies, especially through social context endorsement (friends of endorsers on SNS or electronic word-of-mouth), has been well documented in the marketing research field. An experiment conducted to compare the effectiveness of various Facebook advertisements, including online banner advertisements and advertisements with the names of friends who were also fans on the Facebook page, revealed that the latter worked better in enhancing users' impressions of the product [56]. It has also been revealed by advertising researchers that consumers are more likely to reject advertisements if marketers explicitly show their persuasive motives. However, these messages became more acceptable if their close acquaintances posted positive comments on the advertised product [56,57]. The seamless peer-to-peer transmission of marketers' messages highlighted the challenges for the public health community to set boundaries and to safeguard young people from promotion of unhealthy products.

4.1. Strengths and Weaknesses of the Reviewed Studies

The reviewed studies were generally rated between fair and good. The majority of the studies were cross-sectional; the dearth of prospective longitudinal studies and controlled experimental studies limited the ability to make inferences on direction of causality for this research topic. Only one of the two longitudinal studies reported the follow-up participation rate and this study suffered systematic loss to follow-up (more than 20%) that may have introduced potential attrition bias on their results. More longitudinal studies or controlled experimental studies on this research topic appear warranted. The biggest weakness of the included studies was the self-reported method for capturing the exposure variables. The wide variation of the reported exposure and engagement rates discussed earlier could have resulted from the self-reported data.

4.2. Limitations and Future Research

Several limitations need to be considered when interpreting the results of this review. Firstly, there was a lack of standardization and consistency in measuring digital marketing exposure. The included studies examined marketing impacts of various features of marketing strategies, some more interactive than the others. Additionally, some studies examined mere exposure (if people had seen the promotion), while others examined engagement levels (e.g., likes, shares). The inconsistency of the examined study factors across the included studies may have led to varied study outcomes. Secondly, the majority of the studies included in this review were conducted in developed countries. Research in less economically developed countries is needed due to the growing unhealthy commodities promotion and the increased technology use in these countries [58,59]. Thirdly, digital marketing is only a small part of companies' promotional efforts for their products. More weight can be added to the literature by comparing the influence of digital marketing to the marketing strategies carried out on different channels. Lastly, there is a possibility of publication bias that studies did not find any signification association may not have been published.

5. Conclusions

This review concludes that exposure to digital marketing may be associated with young people's attitudes and behaviors for a range of unhealthy commodities. Marketing contents transmitted through young people's social online interactions (earned media) blurs the boundary between user- and marketer-generated contents and appears to have a greater impact than the more explicit online advertisements (owned and paid media). Given the seamless and pervasive nature of the marketing activities on the digital platforms, there is a need for proactive consideration of effective regulation on unhealthy commodities marketed within the online environment. To our knowledge, this is the first review on the influence of this novel form of marketing exposure on young people. This review contributes to the small but growing body of evidence on this research topic by unravelling the complex relationship between marketing exposure and behaviors and identifying areas for future inquiry.

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Appendix B: The published article of the exposure experiment

2017

Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation

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Abstract
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Keywords
marketing, enhances, exposure, young, investigation, adults', interest, energy, drinks:, exploratory, digital

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RESEARCH ARTICLE

Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation

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Abstract

Young adults experience faster weight gain and consume more unhealthy food than any other age groups. The impact of online food marketing on "digital native" young adults is unclear. This study examined the effects of online marketing on young adults' consumption behaviours, using energy drinks as a case example. The elaboration likelihood model of persuasion was used as the theoretical basis. A pre-test post-test experimental research design was adopted using mixed-methods. Participants (aged 18–24) were randomly assigned to control or experimental groups ($N = 30$ each). Experimental group participants' attitudes towards and intended purchase and consumption of energy drinks were examined via surveys and semi-structured interviews after their exposure to two popular energy drink brands' websites and social media sites (exposure time 8 minutes). Exposure to digital marketing contents of energy drinks improved the experimental group participants' attitudes towards and purchase and consumption intention of energy drinks. This study indicates the influential power of unhealthy online marketing on cognitively mature young adults. This study draws public health attentions to young adults, who to date have been less of a focus of researchers but are influenced by online food advertising.

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Introduction

Young adults are experiencing rapid weight gain [1–2] and are at greater risks of developing weight-related non-communicable diseases over time. Data from the Australian National Health Survey 2014–15 indicated that approximately 39% young adults aged 18–24 years were overweight or obese [3] and this age group consumed more unhealthy food and beverages than any other age groups [4]. Despite the growing health issues among this age group, research about influences on young adults' consumption behaviours is scarce.

This study defined "young adults" as those aged 18 to 24 years, consistent with Australian National Health Survey 2014–15 classification and also previous publications on young Australians' health-related behaviours [5–7]. The years from 18 to 24 years mark a distinct life stage. Some have defined this stage as "emerging adulthood", a transitional stage between

adolescence and full adult status [8]. Legally, they are adults, but they are still on the learning stage of becoming adults where many experience transitions from high school to work or college, from the parental home to their own accommodation, from passive meal recipients to first time food purchasers and preparers [9, 10]. The fact that this age group may face new challenges in life such as food purchase and preparation, but legally no one holds responsibilities over them, may open up new marketing opportunities for food and beverage industry. As indicated by Freeman et al. [10], the food industry may shift their promotional target from children to young adults in response to the increasing scrutiny over children's unhealthy food marketing exposures.

Unhealthy food and beverage marketing towards young adults through the digital media is of particular relevance. This form of marketing is less scrutinised than the traditional marketing on television or in newspapers [11] but is pervasive for young adults who have grown up surrounded by digital technologies and have a strong online presence [12]. The more engaging and invasive forms of advertising on digital platforms, such as through social media sites and advergames, have been linked to unhealthy food consumption among children [13–14]. Such online advertising may also be appealing to young adults. It is unknown how the persuasive messages of online food marketing influence young adults, as it is often assumed they have developed cognitive capabilities to critically interpret the persuasive intent of marketers [15].

Unhealthy products that are particularly relevant to digital food marketing and young adults are energy drinks. Energy drinks are a new beverage category, defined as *"a non-alcoholic caffeine containing beverage typically consumed to provide an energy boost or for mental alertness"* [16]. Common examples of these drinks in the Australian market include Red Bull, Mother, V, Monster and Rockstar. Energy drinks were selected as a case example in this study due to a number of reasons. Firstly, consumption of energy drink is a public health concern. These drinks contain high amounts of caffeine and stimulants such as guarana, ginseng, and B groups vitamins, with varying amounts of sugar and protein, which can be linked to weight gain and a range of adverse health events such as headache and irritation [17–19]. A recent review conducted by Visram and colleagues [20] further suggested that the consumption of energy drinks are associated with risky behaviours, including sensation-seeking and self-destructive behaviours. Secondly, these drinks are marketed to improve alertness, concentration, and stamina [21] and may therefore be especially popular among young people, students and party-goers. Thirdly, energy drink brands predominantly utilise digital media for promotional purposes, for example, website, online games and social media platforms such as Facebook, Twitter, and YouTube [22]. Lastly, marketing of energy drinks is not strictly regulated in Australia. Energy drinks are regulated under the Food Standard Australia New Zealand (FSANZ) code in relation to product composition and labelling [23]. The advertising and marketing code established by the Australian Association of National Advertiser (AANA) does not cover marketing activities on digital platforms [24].

The mechanisms of the influences of digital marketing on food-related behaviours are not well understood. Marketing literature exploring tobacco, alcohol, and fast food products adopted the notion of marketing receptivity to understand consumers' responses to marketing contents [25–27]. This approach suggested that consumers' responses progress through several stages before any behaviour change. Responses range from low receptivity (exposure to marketing contents), to medium receptivity (attend to and understand the marketing contents), and then high receptivity (development of a cognitive or affective response to the marketed products or brands) [25–27]. Evidence of consumers' receptivity to the marketing contents includes indications of positive cognitive or affective responses to the marketing contents or communications [25], such as a change in attitude towards the marketed product or brand

[28]. Attitude changes have been recognised by numerous psychological theories as one of the intermediate mental effects of marketing exposure [28, 29].

The present study applied the concept of marketing receptivity to explore the possible causal pathway where exposure to digital food marketing may prompt a mental response (attitude change) as well as intermediate cued purchase and consumption intentions of the marketed brands and products. We hypothesised that exposure to digital marketing of energy drinks would enhance young adults' attitudes towards, and intended purchase and consumption of, these drinks. Findings from our study indicated that digital food marketing has impacts on young adults' attitude towards and their intended purchase and consumption of energy drinks.

Materials and methods

This study adopted a pre-test post-test control group experimental model. A mixed-methods design was employed utilising a quantitative survey technique complemented by qualitative semi-structured interviews. All materials and procedures were approved by the University of Wollongong Human Research Ethics Committee (HE15-280). Participant Information Sheets were provided to the participants and their written consents were obtained before their participation in the study.

Participants

Young adults aged 18 to 24 years were recruited in the Illawarra region of New South Wales, Australia, between July 2015 and March 2016. Recruitment included promoting the study through handing out flyers in university lectures and community colleges, at bus-stops, community centres, local sports clubs and a local theme park; posts and tweets on social media sites; and snowball sampling. The study was promoted as a study about Internet usage and food consumption. The advertisement did not make it explicit that it would be asking questions about energy drinks marketing in order to recruit both energy drinks users and non-users. Any young adults aged 18 to 24 years and knew how to use the Internet met the inclusion criteria. Individuals who were interested to participate in the study contacted the lead author via email or phone. Times and venues (all public spaces) were then arranged for the study at participants' convenience. Participants were randomly assigned to either the control or experimental group. Randomisation was performed after the study sessions were booked; the lead author randomly picked out sealed envelopes that contained control or experimental surveys. Participants who completed the study were entered into a lucky draw of iTunes and Coles (major supermarket) vouchers of different values ($10-$50) as recognition for their time.

Materials

Exposure experiment. The selected exposure materials to examine the impact of digital marketing on the participants in the experimental group were the websites and social media sites of two popular energy drinks brands: *Red Bull* and *V Energy*. These two brands were selected due to their popularity [30] and their distinctive marketing appeal strategies, as revealed in a previous content analysis of a range of energy drinks' websites and social media sites [31]; *Red Bull* positions their brand as a high budget, sophisticated energy drink product by sponsoring high risk, expensive sports such as Formula 1 car racing, while *V Energy* used sophomoric humour such as superheroes to attract audiences. Control group participants were exposed to the websites and social media sites of two nut bars brands; *Carman's* and *Go Natural*. An online search of beverage products for the healthy comparison was conducted but

beverage options such as soft drinks, sports drinks and water products do not use online brand images promotion. The two nut bar brands were selected as they were relatively healthy food products in comparison to energy drinks and their use of positive brand images as marketing strategies was similar to the selected energy drink brands. All of the selected sites were publicly accessible. The researcher audited the sites every fortnight to ensure the exposed materials were consistent across the period between the first participant, who completed in July 2015, and the final participant, who completed in March 2016.

Pre- and post-test surveys. Experimental and control group participants self-completed the paper-based surveys at pre- (S1 Fig) and post-test (S2 and S3 Figs). Participants' attitudes towards, and purchase intention of, the two test energy drinks brands and energy drinks products in general were measured at both time points. Nut bars, soft drinks and muesli bars brands were included in the surveys as distractors. Participants' attitudes towards the energy drinks were measured by the mean of five 7-point semantic-differential scales; "bad/good", "unfavourable/favourable", "unappealing/appealing", "likeable/unlikeable", "pleasant/unpleasant". This scale had previously been used by other studies to measure brand attitudes [32–33] and was derived from Batra and Stayman [34]. The internal consistency of these measures was (Cronbach Alpha Analysis) $\alpha = 0.941$. Participants' purchase intentions of energy drinks were measured by the widely used 5-point intention scale [35], ranging from "definitely will not purchase" to "definitely will purchase". Demographic and Internet usage questions were also included in the pre-test survey.

Post-test semi-structured interview. The post-test quantitative survey was supplemented by a semi-structured interview (S4 and S5 Figs). The audio-recorded interviews were conducted by the lead author, who also wrote field notes during the interviews. Research into young adults' beliefs and attitudes towards digital marketing of food and beverage products is scarce and hence the interview was used to provide insights into participants' thoughts and feelings about the exposed materials, brands and energy drinks products in general. The interview questions were categorised into two main sections: (i) perceptions of brands, where participants' were asked their views of the test energy drink brands, as well as the exposed websites and social media sites, and (ii) perception of energy drinks, where participants were asked about their own experiences and thoughts of energy drinks products and the consumption of these drinks among young people. Questions about nut bar products were included for the control group participants.

Procedures

Participants took approximately 30 minutes to complete the study: pre-test survey (approximately 10 minutes), exposure experiment (fixed length- 8 minutes; 4 minutes on each brand), and post-test survey and semi-structured interview (approximately 10-15minutes). Participants filled in the pre-test survey before they were asked to browse the two selected energy drinks brands' websites and social media sites (nut bar brands for control group). Participants were told to browse the sites freely using a laptop; they were allowed to browse whatever contents on the sites they chose, e.g. photos, videos, company information, advergames, recipes, as long as they stayed within the same website. After browsing the online materials, participants were asked to fill in the post-test survey and to participate in the interview. To measure participants' food and beverage products preferences, participants were asked to select one food or drink item from a range of food and beverage products photos displayed on a poster before and after the experiment. To mimic a real-life 'unsupervised' web browsing scenario, the study was conducted at community settings (e.g., meeting rooms, cafes and parks) and participants were not 'supervised' during the study. Participants in the experimental group were given a

Fact Sheet about the negative impacts of energy drinks consumption [36] after the completion of the study.

Statistical analysis

Quantitative data analysis. A pilot study ($N = 16$) was conducted to pre-test the research instruments and to calculate the required sample size using G-Power statistical analysis software [37]. The input parameters entered into the software were effect size = .8, $\alpha = .05$, and between-groups comparison effect size of attitude change towards energy drinks observed in the pilot study (d = .52). A total sample size of 60, 30 each in two groups, was needed to obtain statistical power of .92 level [38].

Statistical analysis was undertaken using the Statistical Package for Social Sciences (SPSS) for Windows, version 21. The internal consistency of the previously standardised attitude scale was examined by Cronbach Alpha Analysis. Based on data distribution, Independent sample t-tests or Mann-Whitney U tests were utilised to determine the changes in attitudes towards, and purchase intention of, energy drinks. Fisher-exact test was used to examine the changes in intended consumption of energy drinks before and after the experiment. P values of < 0.05 were considered statistically significant.

Qualitative data analysis. Qualitative data were analysed based on the field notes taken by the lead author during the interviews. The audio-recordings were used to check the completeness of written field notes as soon as the interviews were completed and while the reflections remained fresh [39]. The primary purpose of the semi-structured interview was to identify key factors which had led to the changes in attitudes measured after the experiment and verbatim transcription of the audio data was not undertaken. The benefits of using written field notes during the interview have been demonstrated by several researchers [39–40]; not only that it may improve the efficiency, it may also ease the difficulties of data coding. Content analysis [41] was then conducted to elicit common themes arising from the participants' responses about their perceptions of the energy drinks brands as well as the exposed online materials. Content analysis involved: (i) open coding where the written notes were read through several times and (ii) grouping and categorisation where the headings were assigned to related contents before they were grouped into higher order categories [41]. The co-author who was not involved in the data collection reviewed the established themes and the respective responses. The established themes were categorised based on the elaboration likelihood model (ELM) of persuasion as discussed below.

Theoretical framework

The elaboration likelihood model (ELM) of persuasion as proposed by Cacioppo and Petty [42] has particular relevance to the examination of food marketing impacts. Various studies have used ELM to understand the influences of product advertising [43–45]. ELM is a framework that describes the thinking processes that might occur when an individual is exposed to persuasive communication. ELM highlights dual routes of information processing, central and peripheral, that may lead to changes in an individual's attitudes and behaviours [44–45]. In the central route, an individual engages in high level information processing, that is, he/she carefully thinks about the persuasive message. An example of a central cue is the nutrition claims of a food product. In contrast, a peripheral route involves low level of information processing. An individual processes the message without much cognitive effort. A common peripheral cue used by advertisers is emotional appeals, such as fun and happiness [45]. The more pertinent element of ELM in this study was anticipated to be the peripheral route, as previous analyses of the digital marketing contents of energy drinks brands [31] have found that the energy drinks

Table 1. Characteristics of study participants at pre-test.

Characteristics	Experimental (*N* = 30)	Control (*N* = 30)	*P* value	Total (*N* = 60)
Gender [a]			.194	
Male	16	11		27
Female	14	19		33
Age [b], *Mean yr*	20	20	.892	20
Education level [c]			.643	
High school or equivalent	3	4		7
TAFE qualification or equivalent	3	5		8
Bachelor's degree	21	17		38
Postgraduate qualification	3	4		7
Internet usage [c]			.068	
Several times a week	2	1		3
Every day	13	7		20
Several times a day	15	22		37
Usual Internet activity [c]				
Emails	28	26	.977	54
Online games	9	10	.783	19
Facebook	28	28	1.000	56
YouTube	23	24	.756	47
Twitter	6	4	.492	10
Online shopping	16	17	.442	29
News	15	17	.608	22
Attitude [b] *Mean± SD*				
Red Bull	-0.5 ±1.4	-0.5 ±1.7	.947	-0.5 ± 1.5
V Energy	-0.5 ±1.4	-0.8 ±1.4	.402	-0.7 ± 1.4
Energy drink products (general)	-0.4 ±1.5	-0.5 ±1.8	.824	-0.5 ± 1.6
Purchase Intention [c] *Median (mode)*				
Red Bull	-1.0 (-2.0)	-1.0 (-2.0)	.588	-1.0 (-2.0)
V Energy	-1.0 (-2.0)	-1.5 (-2.0)	.753	-1.0 (-2.0)
Energy drink products (general)	-1.0 (-2.0)	-1.0 (-2.0)	.545	-1.0 (-2.0)

[a]Pearson Chi-square test
[b]Independent sample t-test
[c]Mann-Whitney U test

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industry steered away from actual product promotions/information and used emotional appeals like excitement to engage young adults.

Results

Participants in the experimental and control groups were similar (statistically) in gender, age, education levels, Internet usage, and their usual Internet activities (Table 1). Although attempts were made to recruit participants from various demographic backgrounds, the majority of the study participants were university students ($N = 49/60$). At pre-test, participants' attitudes towards, and purchase intention of, the test energy drinks brands and energy drinks products in general were similar between experimental and control groups (Table 1).

Table 2. Comparisons of participants' attitudes towards and purchase intention of, energy drinks after the experiment.

Measures	Post-test–Pre-test (*N* = 60)	Test result
Attitude[a] *Mean ± SD*		
Red Bull	0.3 ± 1.0	$t(42) = -4.1$, $p = .000$*
V Energy	0.3 ± 1.1	$t(53) = -3.5$, $p = .001$*
Energy drinks products (general)	0.2 ± 0.8	$t(50) = -4.5$, $p = .000$*
Purchase Intention[b] *Median (Interquartile range)*		
Red Bull	0.0 (0.0–1.0)	$U = 222.5$, $p = .000$*
V Energy	0.0 (0.0–1.0)	$U = 243.5$, $p = .000$*
Energy drinks products (general)	0.0 (0.0–1.0)	$U = 395.5$, $p = .300$*

*Significantly different when $p < .05$

[a]Independent- samples t-test

[b]Mann-Whitney U Test

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Attitudes and purchase intention

Effect sizes of the study were calculated based on the attitudes changed; the between group effect size was $d = 0.71$ while the within group effect was $d = 0.55$. Both were medium effect sizes [38].

Participants in the experimental group had significantly better attitudes towards the two test energy drink brands *Red Bull* ($t(42) = -4.1$, $p = .000$) and V Energy ($t(53) = -3.5$, $p = .001$), as well as energy drinks products in general ($t(50) = -4.5$, $p = .000$) than the control group participants after the experiment. After the experiment, participants in the experimental group compared with control group participants also showed significantly greater purchase intention of the two test energy drinks brands *Red Bull* ($U = 222.5$, $p = .000$) and *V Energy* ($U = 243.5$, $p = .000$), as well as energy drinks products in general ($U = 395.5$, $p = .300$) (Table 2).

Between group comparisons showed that at post-test, the participants in the experimental group showed significantly more positive attitudes towards the two test energy drink brands (*Red Bull*'s mean difference of an average of 5 x 7-point semantic scales = 1.0±1.8, $p = .038$; *V Energy*'s mean difference = 1.2±1.6, $p = .006$) and energy drinks products in general (mean difference = 1.0±1.6, $p = .028$), and slightly greater purchase intention of *V Energy* ($Z = -2.01$, $p = .044$) as compared to the control group (Table 3).

Attitudes of the experimental group participants towards the two test energy drink brands (*Red Bull*'s mean difference = 0.8±1.5, $p = .001$; *V Energy*'s mean difference 0.8±1.6,

Table 3. Between group comparisons at post-test.

	Brand/Product	Experimental	Control	*P* value
Attitude[b](5 item; -3 to 3) *Mean ± SD*	Red Bull	0.3 ± 1.7	-0.7 ± 1.8	.038*
	V Energy	0.2 ± 1.7	-1.0 ± 1.5	.006*
	Energy drink products (general)	0.2 ± 1.5	-0.8 ± 1.7	.028*
Purchase intention[a](-2 to 2) *Median (mode)*	Red Bull	0.0 (-2.0)	-1.0 (-2.0)	.087
	V Energy	-0.5 (-2.0)	-2.0 (-2.0)	.044*
	Energy drink products (general)	-1.0 (1.0)	-1.5 (-2.0)	.108

*Significantly different when $p < .05$

[a] Mann-Whitney U Test

[b] Independent- samples t-test

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Table 4. Within group comparisons.

Experimental				
	Brand/Product	**Pre-test**	**Post-test**	***P* value**
Attitude [b](5 item; -3 to 3)*Mean ± SD*	Red Bull	-0.5 ± 1.4	0.3 ± 1.7	.001*
	V Energy	-0.5 ± 1.4	0.2 ± 1.7	.001*
	Energy drink products (general)	-0.4 ± 1.5	0.2 ± 1.5	.000*
Purchase intention [a](-2 to 2)*Median (mode)*	Red Bull	-1.0 (-2.0)	0.0 (-2.0)	.006*
	V Energy	-1.0 (-2.0)	-0.5 (-2.0)	.003*
	Energy drink products (general)	-1.0 (-2.0)	-1.0 (1.0)	.223
Control				
Attitude [b](5 item; -3 to 3)*Mean ± SD*	Red Bull	-0.5 ± 1.7	- 0.7 ± 1.8	.129
	V Energy	-0.8 ± 1.4	- 1.0 ± 1.5	.447
	Energy drink products (general)	-0.5 ± 1.8	- 0.8 ± 1.7	.036*
	Carmans' nut bar	1.0 ± 1.3	1.8 ± 1.0	.000*
	Go Natural's nut bar	0.7 ± 1.2	1.2 ± 1.2	.068
	Nut bar products (general)	1.2 ± 1.1	1.4 ± 1.0	.108
Purchase intention [a](-2 to 2)*Median (Mode)*	Red Bull	-1.0 (-2.0)	-1.0 (-2.0)	.046*
	V Energy	-1.5 (-2.0)	-2.0 (-2.0)	.046*
	Energy drink products (general)	-1.0 (-2.0)	-1.5 (-2.0)	.589
	Carmans' nut bar	1.0 (1.0)	1.0 (1.0)	.003*
	Go Natural's nut bar	1.0 (1.0)	1.0 (1.0)	.951
	Nut bar products (general)	1.0 (1.0)	1.0 (1.0)	.052

*Significantly different when $p < .05$

[a] Wilcoxon-Signed Rank Test

[b] Paired-samples t-test

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$p = .001$), as well as energy drink products in general (mean difference = 0.6±1.5, $p = .000$) were all significantly improved after the experiment (Table 4). Participants' average attitude scale values all moved from the negative to positive ends. Although the experimental group participants' purchase intentions towards the energy drinks remained negative, their purchase intentions of the two test energy drink brands (*Red Bull* Z = -2.724, $p = .006$; *V Energy* Z = -3.000, $p = .003$) were improved statistically significantly after the test. Surprisingly, control group attitudes towards energy drinks products in general, and their purchase intention towards the two energy drinks brands were significantly worsened at post-test although they were not exposed to any energy drinks materials. As a side note, control group participants showed better attitude towards and greater purchase intention towards one of the test nut bar brands.

Consumption intention

The participants involved in the exposure experiment had significantly enhanced intention to consume energy drinks at post-test. Seven participants showed positive change, from no intention to consume energy drinks at pre-test to intended to consume energy drinks at post-test, $\chi^2(1) = 7.9$, $p = .005$ (Table 5). The number of participants in the experimental group who selected energy drinks from the poster rose from four to eleven after the experiment. Control group participants had greater intention to consume nut bar products after the experiment $\chi^2(1) = 16.6$, $p = .000$.

Table 5. Participants' intended consumption of the energy drinks and nut bar products after the experiment.

Consumption Intention[a] *Count*	Experimental ($N = 30$)	Control ($N = 30$)	Positive change from pre-test to post-test[b] ($N = 60$)	Test result
Energy drinks products (general)				
Pre-test	4	2		
Post-test	11	0	7	$\chi^2(1) = 7.9, p = .005$*
Nut bars products (general)				
Pre-test	4	6		
Post-test	2	19	13	$\chi^2(1) = 16.6, p = .000$*

*Significantly different when $p < .05$

[a]Fisher's exact Test

[b]Weight cases command was conducted before chi-square analysis on a contingency table. Due to the small sample size, Fisher's exact Test was used.

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Qualitative interview findings

Appealing factors of the exposed online materials and brands. Consistent with the quantitative survey findings, a number of participants in the experimental group reported the exposure to the online materials had somewhat improved their feelings towards the test brands, with the majority of the participants showing more positive attitudes towards at least one of the test energy drink brands. A range of appealing elements (Fig 1) on the test brands digital platforms changed participants' attitudes towards these brands. The most widely mentioned factors were the corporate social responsibility initiatives reported by the brands, community involvement and sponsorship from *Red Bull*. For instance one participant *(participant a, male, 18 years)* noted,

> *"Feel like they are trying to do good stuff for the environment; their cans are 100% recycled, and minimise transportation. . .that's a good thing, also they sponsored a lot of sports. . .".*

Both brands listed their drink products' nutritional information on their websites. The majority of participants favoured the "honesty" of the brands, for example,

> *"V showed their nutrient contents, I was surprised by the low guarana content, it is not shady at all, really appealing".*
> *(participant b, male, 18 years)*

Only a minority of the participants took a more critical approach towards the nutritional claims made by the brands,

> *"I looked at the ingredients of both brands, so superficial, no scientific proof benefits. . . some of them are just a sentence, don't believe that it will help me to concentrate at all".*
> *(participant c, male, 22 years)*

The superhero theme of V Energy appeared to be a selling point for some participants. *"I am into Avengers (movie) that would convince me to purchase V over Red Bull. . ." (participant d, female, 18 years).* The majority of the participants visited the test brands' social media sites

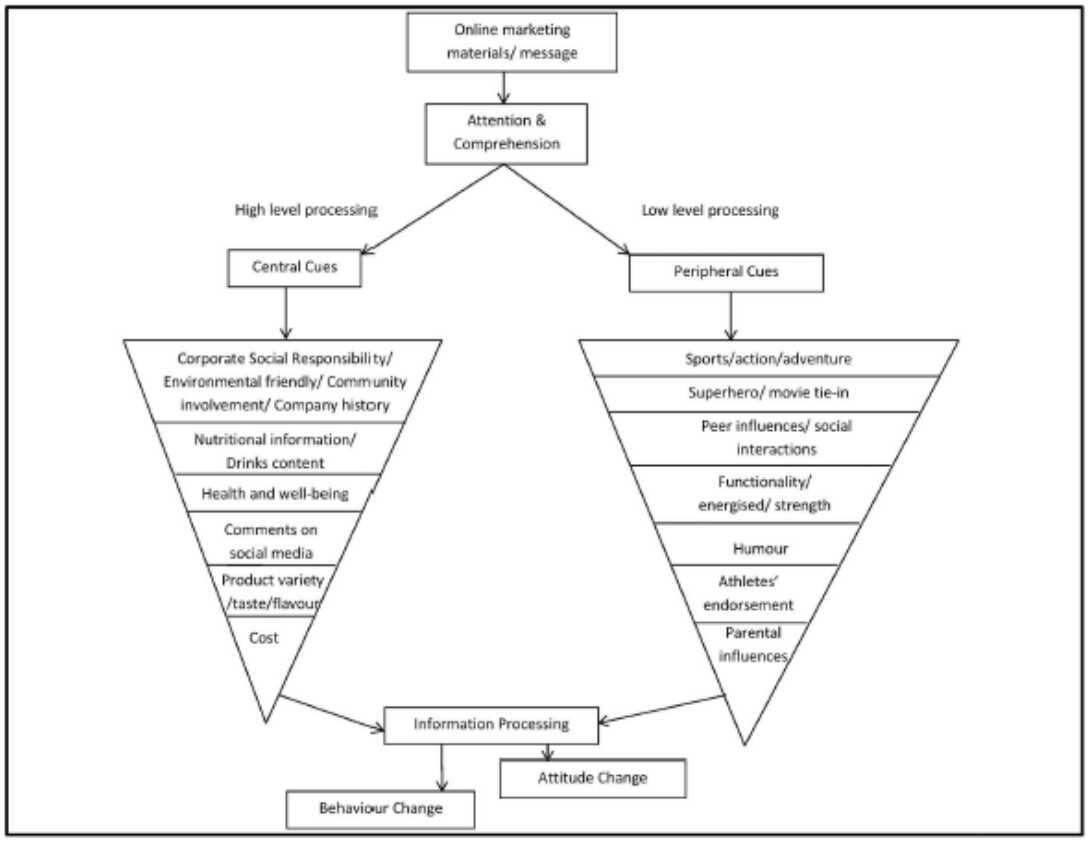

Fig 1. Qualitative findings using ELM as a theoretical basis.

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(mainly Facebook) during the experiment. The comments that were posted from other Facebook users seemed to have greater influence on the participants than posts by the companies;

"V's Facebook page was filled with positive comments from the others and the website was more engaging (not just about sports)…", "Red Bull's Facebook page made it even more unappealing, a lot of people left negative comments on their Facebook page…"
(participant e, female, 22 years).

Views on energy drinks. Relatively few frequent energy drinks users participated in the study.

The majority of the participants reported they had their first energy drinks when they were teenagers, usually under peer influence,

"I first tried energy drinks in year8 or 9, friends bought me the drink, felt cool to drink it, we were under 18, can't drink alcohol, so it was the next best thing…"
(participant f, female, 18 years).

Although most of the participants reported they had 'grown out of' / no longer consumed these drinks, many reported consuming energy drinks for functionality purposes, such as for stamina for assignments, computer games, shift work and parties. Almost all participants were aware of the 'practice' of mixing alcohol with energy drinks and many reported they had consumed these drinks when going out parties with friends, despite reporting they knew the drinks were 'bad' for them.

Discussion

This study demonstrated the potential influential power of food and beverage digital marketing on cognitively mature young adults. After a short exposure to digital marketing materials, participants had a better impression of, greater purchase intention and were more likely to consume energy drinks. Of surprise was the revelation that central cues, such as corporate social responsibility as demonstrated by the brands, was reported by the participants in a manner that implied they had greater impacts on the young adults than the peripheral cues like emotional appeals.

The positive association between digital marketing and attitudes towards the beverage brands observed in this study contributes new insights into the influences of online environments on young adults' food-related behaviour. There have been a growing number of studies reporting on the use of digital platforms for marketing that have established the association between online alcohol marketing and consumption behaviours [46–50]. These studies, however, were cross-sectional designs and could not determine the direction of causality. There was one controlled intervention where the authors compared the effects of alcohol marketing online between states in the United States of America (USA) that do or do not have bans on advertising alcohol. This study found digital marketing of alcohol reduced the effectiveness of alcohol advertising bans [51], which indicated the influential power of online marketing materials on consumers' attitudes towards food products. Previous studies on alcohol have argued that exposure to marketing contents enhanced consumers' receptivity to alcohol marketing [28, 47]. Although not the same product category, our findings contribute to this literature showing how young adults may become receptive to risky product marketing.

The study reported here found that young adults' attitudes towards, purchase and consumption intentions of the brands were influenced by digital marketing. Online content that was most highly reported to have influenced their attitudes towards the brands were linked to central information processing cues, that information cognitively elaborated through the central route, as described in the ELM framework. There is a general assumption that young adults are cognitively mature and possess the ability to understand the persuasive intention of marketers [52]. However, our findings suggest that although young adults realised the online materials were designed to promote energy drinks products, they were not necessarily capable to defend themselves against marketing content such as the brands' community involvement, contribution to charities, and environmentally friendly efforts (i.e. corporate social responsibility). Young adults also valued the 'honesty' of the brands by declaring the contents of their drink.

The ability of these central cues to distort the promotion intentions of the online marketing among young adults was unexpected. Previous assessments of the content of food advertising, especially among children, has generally found that emotionally evocative peripheral cues in television advertisements were used to attract audiences [45, 53]. Our experiment only included a short exposure and the improvements in attitudes towards brands may only have a short lasting effect. However, this finding was significant since central cues are believed to have more profound impact on attitude changes and more predictive of future behaviour than

the peripheral cues [42]. Additionally, participants in this study were mainly educated young adults who reported to be aware of the health problems of energy drinks products. The impact of online marketing could be greater among young adults who are less educated or less health conscious.

The classification of central cues in this study was based on the assumption that participants may take more time to evaluate information such as the brands' contributions to the environment. Although literature on corporate image advertising has previously discussed the notion of the processing of corporate social responsibility messages from the ELM insights [54–55], none have explored whether these messages are evaluated through the central or peripheral route. Participants' pre-existing attitudes and personal values towards corporate social responsibility issues may influence how they assess these messages [56]. For instance, an individual who does not favour corporate social responsibility work may automatically process the message as sceptical (peripheral route to persuasion) whereas an individual who favours the notion of corporate social responsibility may scrutinise the information further (central route to persuasion) [55]. Given that the corporate social responsibility practices portrayed on the websites were mainly written contents and required participants' thoughtful assessment, corporate social responsibility practices were classified as central cues in this study.

The interviews in this study also revealed other factors that contributed to young adults' consumption of energy drinks, including peer influences and social opportunities involving mixing alcohol with energy drinks at parties. It was unknown whether these factors were induced by the peripheral cues of the online marketing messages (e.g. energised, fun). Many participants reported to have first started consuming energy drinks during adolescence. Future studies may need to include participants from a younger age group.

Although not the main focus of this study, control group participants showed more positive feelings, greater purchase and consumption intentions towards one of the nut bar brands. Oddly, they also reported more negative attitudes towards the energy drinks brands although they were not exposed to any energy drinks related online materials. One possible explanation for this was that the healthy messages delivered on the nut bar brands sites may have counteracted participants' desire to have unhealthy products. This unexpected finding highlighted a potential avenue for public health intervention. Positive brand image portrayed by the food companies may be effective in increasing healthy food consumption while reducing unhealthy food consumption. Future studies may explore further on this.

Strengths and limitations

The strengths of this study included the use of qualitative interviews to supplement the findings of quantitative surveys, and the application of ELM as a theoretical framework to better understand the variables that might have influenced young adults during the online exposure. Our pre-test post-test control group experimental trial was sufficiently powered and statistically significant changes were found on participants' attitudes, purchase and consumption intentions. However, these findings need to be interpreted with caution since the regional, non-representative convenience sample may limit the generalisability of our findings. Recruitment of young people from lower socio-economic backgrounds remains a challenge but the impact of online unhealthy food marketing on this cohort warrants further investigation. The medium effect size of this study was in accordance with other research on attitudes towards food advertising where small to moderate effect sizes were found [57–58]. Participants in the control group were more likely to be females and have higher Internet usage. These differences were not statistically significant but could potentially influence the findings, for example, female participants may have different responses to the macho image (extreme sports) of

energy drinks brands. Another limitation of the study was that participants were given a task to browse the sites during the experiment and thus may have paid more attention than normal to the information presented online. This might explain the highly reported processing of central cues in this study. This could also potentially introduce bias if the participants felt that the researcher anticipated some changes at post-test, although the true motive of the study was masked. As pointed out by other relevant advertising literature, digital marketing exposure is only one of the many factors that influence consumers' receptivity to the marketing contents [26, 29]. Further studies are required to explore other precursors or influences that lead to young adults' consumption of risky food or beverage products.

Conclusions

With the greater interactions of young people with online environments and social media, it is important to understand how young people's consumption patterns and health behaviours may be affected. This study provides useful insights into the online environment that may contribute to unhealthy behaviours of young adults. Greater understanding of the types of cues and their influences on young adults' attitudes and potentially also their behaviours can inform professional practice and regulatory policies relating to online environments.

Supporting information

S1 Fig. Pre-test survey. Self-administered survey for both the experimental and control groups' participants before the exposure experiment.
(DOC)

S2 Fig. Post-test survey (experimental group). Self-administered survey for experimental group participants after the exposure experiment.
(DOCX)

S3 Fig. Pos-test survey (control group). Self-administered survey for control group participants after the exposure experiment.
(DOCX)

S4 Fig. Post-test interview guide (experimental group). Semi-structured interview guide for the experimental group participants after the exposure experiment.
(DOCX)

S5 Fig. Post-test interview guide (control group). Semi-structured interview guide for the control group participants after the exposure experiment.
(DOCX)

S1 File. Minimal dataset. Minimal dataset obtained from pre- and post-test surveys.
(XLSX)

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Data curation: LB.

Formal analysis: LB.

Funding acquisition: LB.

Investigation: LB.

Methodology: LB BK HY.

Project administration: LB.

Resources: LB.

Software: LB.

Supervision: LB BK HY.

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Appendix C: The published online survey manuscript

UNDER EMBARGO UNTIL OCTOBER 5, 2018, 12:01 AM ET

Podcast available online at www.jneb.org

Research Article

Digital Promotion of Energy Drinks to Young Adults Is More Strongly Linked to Consumption Than Other Media

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ABSTRACT

Objective: To examine whether digital marketing strategies are more strongly associated with energy drink use than other marketing and whether Theory of Planned Behavior (TPB) constructs mediated the effects of digital marketing on energy drink use.

Design: A cross-sectional online survey using the TPB was administered in 2016.

Setting: Illawarra region of New South Wales, Australia.

Participants: A total of 359 young adults aged 18–24 years completed the survey. Participants were mainly students.

Main Outcome Measures: Relative impacts of digital and other marketing on energy drink use and the mediating effects of TPB constructs: attitudes, subjective norm, and perceived behavioral control.

Analysis: Stepwise regression analysis was employed to compare the effects on energy drink use from digital and other marketing. Mediation analysis was used to examine the mediating effects of the TPB constructs.

Results: Digital marketing was more strongly associated than other marketing with young adults' energy drink use. Attitudes, subjective norms, and perceived behavioral control mediated the effects of digital marketing on energy drink use.

Conclusions and Implications: The marketing of unhealthy food and beverages such as energy drink products on the Internet requires greater scrutiny. Future interventions may focus on strategies to attenuate young adults' attitudes toward energy drinks, denormalize energy drink use, and strengthening self-efficacy to reject energy drinks among this age group.

Key Words: digital marketing, energy drinks, Theory of Planned Behavior, unhealthy food marketing, young adults (*J Nutr Educ Behav.* 2018; 50:888–895.)

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INTRODUCTION

Digital marketing of unhealthy commodities, including the promotion of products through websites and social media,[1] has drawn the attention of health care professionals and policy makers because of its potential impacts on consumption behaviors.[2] A large body of research confirmed the negative influences of commercial marketing of food and beverages through other forms of marketing, particularly traditional media platforms (ie, television), on children.[3–5] Because of the ubiquitous, interactive, and 24/7 availability of digital technologies,[6] digital marketing of unhealthy food and beverages may have greater effects relative to other forms of marketing.[2,7] A systematic review of the effects of digital marketing of unhealthy commodities concluded that digital marketing enhanced young people's beliefs regarding these products and their intended and actual consumption.[8] Nevertheless, the relative impact of digital marketing compared with other media marketing is unknown.

The potential negative impacts on young adults of digital marketing of unhealthy products, particularly alcohol and tobacco products, were documented in previous literature.[9–11] However, digital marketing effects of food and nonalcoholic beverage products have not been well explored. One experimental study demonstrated that online marketing enhanced young adults' interests, purchase, and consumption intentions toward an unhealthy beverage. This evidence refuted assertions that this age group has sufficient cognitive capabilities to oppose marketing persuasion.[12,13] Young adults are a high-risk group; they have faster weight gain[14] and greater consumption of unhealthy food and beverages than other age groups[15]

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Conflict of Interest Disclosure: The authors have not stated any conflicts of interest.

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and live much of their lives interacting on the Internet. In Australia, for example, 98% of young people aged 18–24 years are Internet users.[16] Marketing strategies incorporating digital media are also likely to appeal to this age group: for instance, through peer-to-peer online interactions on social media. This refers to peer sharing of product information or promotions through active user engagement with social media platforms such as liking and sharing posts on Facebook.[17]

The researchers chose energy drinks as the focus of this study to examine the effects of digital food marketing on young adults. Energy drinks represent a new nonalcoholic product category, first introduced in 1987 (in Austria) by Red Bull.[18] Although global sales of soft drinks are declining,[19] the energy drink industry is booming, with global sales of 50 billion USD recorded in 2014.[20] These drinks are in high demand, especially among young adults,[21] and have become a central part of partying and sporting culture.[22] These drinks contain caffeine, taurine, vitamins, and other ingredients such as guarana and ginseng. They are commonly marketed to boost physical and mental performance,[23] and the popularity of these drinks has been fueled by these claims.[24] Consumption of energy drinks is a public health concern among children, adolescents, and young adults[24] because they may cause dental problems,[25] cardiovascular and neurological issues,[18] and in rare cases, death.[26]

Theory of Planned Behavior

The Theory of Planned Behavior (TPB)[27] proposes that an individual's likelihood of performing a behavior is based on his or her attitudes, subjective norms, and perceived behavioral control (PBC), which ultimately leads to his or her behavior.[27] It is based on 3 constructs of behavior: attitudes, in which an individual has negatively or positively evaluated a behavior; subjective norms, the individual's perception of social norms that encourage or discourage engagement in the behavior; and PBC, the individual's perceived ease or difficulty in controlling the behavior.[27] Based on TPB, the effects of environmental factors (digital marketing) on behavior (energy drink use) would be mediated by these 3 constructs[28,29] (Figure 1). This study tested the mediating effects of TPB constructs in the relationship between digital marketing and energy drink use. A theoretical understanding of digital marketing–induced unhealthy behaviors may elucidate guidance for more effective health interventions.

The researchers hypothesised that (1) digital marketing would be more strongly associated with young adults' energy drink use than other marketing, and (2) TPB constructs would mediate the effects of digital marketing on energy drink use.

METHODS

Recruitment

The researchers recruited young adults (aged 18–24 years) in 2016 through advertisements in lectures and on students' online learning platforms at 1 university in the Illawarra region of New South Wales, Australia, and through flyers distributed at a local community college, library, youth center, community center, sports clubs, and a shopping center.

Participant information was included on the survey opening page and respondents indicated their consent to participate by continuing. Survey respondents remained anonymous. This study was approved by the University of Wollongong Human Research Ethics Committee (HE16/038).

Measures

The 44-item online questionnaire using SurveyMonkey (SurveyMonkey.com, LLC, Palo Alto, CA) was pilot-tested with persons within the target group (n = 15) to check for an understanding of the items and to estimate the time required to complete the survey. Minor modifications were made to the question format and wording. The questionnaire took approximately 10 minutes to complete. The questionnaire included demographic questions on age, gender, work and education

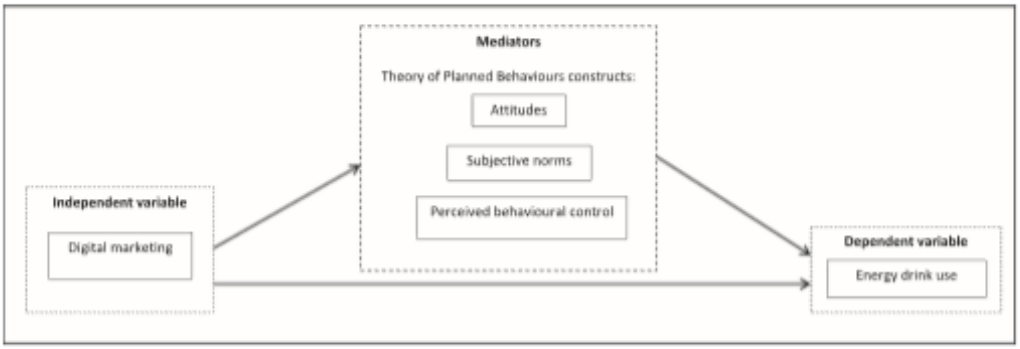

Figure 1. Conceptual framework of mediating effects of Theory of Planned Behavior Constructs in the relationship between digital marketing and energy drink use.

status, and residential postal code, which were then converted into socioeconomic status based on the Australian Bureau of Statistics Socio-Economic Indexes for Areas.[30] Questions asked about exposure to and engagement with the marketing activities of energy drinks; attitudes toward, subjective norms about, and PBC over energy drink use; significant others' (parents', partner's, friends', and siblings') acceptance of their energy drink use (okay or not okay); and energy drink use status. Frequency and amount of energy drinks consumption were also self-reported in the questionnaire. However, because there were few high–energy drink users, subsequent data analyses categorized respondents into energy drink users and nonusers.

Seven items used 4-point Likert scales ranging from 0 = not at all to 4 = often, to examine exposure to marketing of energy drinks for any brand on digital and other media (eg, saw advertisements of energy drinks on the Internet including social media sites) (Table 1). A further 7 items measured engagement with energy drink marketing activities. Respondents were asked to indicate whether they had ever engaged with digital or other marketing for energy drinks (eg, played energy drink–related online games). Average exposure and sum of engagement scores were calculated. Higher scores reflected greater exposure to or engagement with marketing activities.

Attitudes were measured regarding energy drink products and their use (8 questions) (eg, energy drinks improve performance mentally and physically), subjective norms about energy drink products and use (2 questions) (eg, energy drinks are commonly consumed by students and peers), and PBC of energy drink use (5 questions) (eg, confident about refusing to drink even under peer pressure). These items were measured on 5-point Likert scales ranging from 1 = strongly disagree to 5 = strongly agree. Scores were averaged for each person for each factor; higher scores indicated more positive attitudes toward energy drinks, greater subjective norms about energy drinks and use, and greater PBC over energy drink use. These measures were derived from previous studies that explored young people's views about energy drinks.[13,19] Cronbach α coefficients were calculated for the attitudes ($\alpha = .77$), subjective norm ($\alpha = .91$), and PBC ($\alpha = .74$) measures based on results from the main study. Scores > .70 indicated an acceptable measure of internal reliability.[31]

Table 1. Young Adults' Exposure to and Engagement With Energy Drink Marketing and Their Energy Drink Use

Measures	Energy Drink Users (n = 192)	Energy Drink Nonusers (n = 142)	*P*
Exposure to digital marketing[a]			.01*
Internet	169 (88)	113 (80)	
Online games	115 (60)	62 (44)	
Exposure to other marketing[a]			.06
Broadcast (eg, television, radio)	179 (93)	134 (94)	
Printed	142 (74)	105 (74)	
In-store	190 (99)	134 (94)	
Sponsorship	173 (90)	122 (86)	
Endorsement	170 (89)	118 (83)	
Engagement with digital marketing[b]			.01*
Played online game	58 (30)	34 (24)	
Browsed energy drinks website	62 (32)	16 (11)	
Clicked on social media sites	68 (35)	17 (12)	
Watched energy drinks online videos	82 (43)	36 (25)	
Engagement with other marketing[b]			.01*
Received free samples	139 (72)	62 (44)	
Door prizes as incentive	63 (33)	21 (15)	
Owned branded clothing	28 (15)	10 (7)	

[a]Independent-samples *t* test; [b]Pearson chi-square; *$P < .05$.
Notes: Data are presented as n (%). There are 25 missing cases for energy drinks consumption status. Level of exposure was measured as 0 = not at all; 1 = very occasional; 2 = sometimes; and 3 = often. The average score was used in analysis. Level of engagement was measured as 0 = no and 1 = yes. The summation score was used in analysis.

Covariates

Covariates adjusted for in the regression models included age, sex, socioeconomic status, student and work status, and perceived significant others' acceptance of their energy drink use.

Statistical Analyses

Data were analyzed using SPSS (version 21.0, SPSS, Inc, Chicago, Il., 2012). Independent-samples *t* tests and Pearson chi-square tests were conducted to compare differences between energy drink users and nonusers with regard to age, sex, student and work status, exposure to and engagement with digital and other forms of marketing, and attitudes, subjective norms, and PBC about energy drink use. $P < .05$ was considered statistically significant.

The researchers performed stepwise regression to examine the relative impacts of digital marketing compared with other marketing, with energy drink use as the

dependent variable. Energy drink use (yes or no) was regressed on exposure to other forms of marketing in step 1. In step 2, energy drink use was regressed on exposure to other forms of marketing and exposure to digital marketing. In step 3, energy drink use was regressed on exposure to other forms of marketing, exposure to digital marketing, and engagement with other forms of marketing. Finally, in step 4, energy drink use was regressed on exposure to other forms of marketing, exposure to digital marketing, engagement with other forms of marketing, and engagement with digital marketing. Regression analyses were conducted using exposure to other forms of marketing entered as the independent variable in block 1; exposure to other forms of marketing and exposure to digital marketing entered as independent variables in block 2; exposure to other forms of marketing, exposure to digital marketing, and engagement with other forms of marketing entered as independent variables in block 3; followed by exposure to other forms of marketing, exposure to digital marketing, engagement with other forms of marketing, and engagement with digital marketing entered as independent variables in block 4.

Mediation analysis was conducted to examine whether the association between digital marketing and energy drink use variables was mediated by the TPB constructs using the PROCESS macros for SPSS.[32] The significance of the direct effect of the independent variable (digital marketing) on the dependent variable (energy drink use) while controlling for the mediators (TPB constructs), as well as the significance of the indirect effect transmitted by the mediators were simultaneously examined using PROCESS. The significance of the effect was reflected by the unstandardized regression coefficient. Covariates were controlled in this model.

This macro used bootstrapping methods developed by Preacher and Hayes[33] for testing mediation analysis, using a resampling procedure of 1,000 bootstrap samples. Bootstrapping methods provided bias-corrected confidence intervals (CIs) (95%); each effect was considered statistically significant if the range of CI did not include 0 at $P < .05$.

RESULTS

A total of 359 young adults completed the survey. Respondents were mainly students aged 20 years who worked part-time and were from middle-socioeconomic backgrounds (Supplementary Data). Overall, 53% of respondents indicated that they had consumed energy drinks before; 40% had never consumed energy drinks whereas 7% did not indicate their energy drink use status. Energy drink users tended to be males and nonstudents.

Energy drink users reported significantly greater exposure to and engagement with digital marketing activities of energy drinks than did non–energy drink users. They also reported significantly greater engagement with other energy drink marketing activities than did non–energy drink users. Reported exposure to other energy drink marketing activities was not significantly different between users and nonusers (Table 1).

Stepwise regression models showed the relative strengths of digital vs other marketing exposure and engagement with predicting energy drink use (Table 2). After controlling for covariates, only engagement with digital marketing significantly increased the likelihood of consuming energy drinks (adjusted odds ratio = 1.47; 95% CI, 1.02–2.10; $P < .05$). Exposure to digital marketing was not a significant predictor of energy drink use; nor were exposure to and engagement with other marketing. Exposure to digital marketing did not have significant additional impacts on exposure to other forms of marketing activities on energy drink use (step 2). However, in step 4, when engagement with digital marketing was added into the model, the impact of engagement with other forms of marketing activities became insignificant. This showed that the impact of engagement with other forms of marketing was mediated by the engagement with digital marketing.

Theory of Planned Behavior Constructs as Mediating Factors

Figure 2 presents a mediation analysis diagram. Because exposure to digital marketing was not significantly associated with energy drink use, the mediation analysis included only engagement with digital marketing as an independent variable. Engagement with digital marketing was significantly related to energy drink use with TPB constructs ($\beta = .90$; $P < .05$). In addition, engagement with digital marketing was positively related to attitudes ($\beta = .11$; $P < .05$) and subjective norms ($\beta = .07$; $P < .05$) whereas it was negatively related to PBC ($\beta = -.13$; $P < .05$). Finally, the 3 TPB constructs were significantly related to energy drink use (attitudes: $\beta = .87$; $P < .05$; subjective norms: $\beta = 1.10$; $P < .05$; PBC: $\beta = -.99$; $P < .05$). The results of the indirect effect between engagement with digital marketing and energy drink use through the TPB constructs had 95% bias-corrected bootstrap CIs that did not include 0 (95% CI, 0.09–0.48), indicating a significant indirect effect at $P < .05$. The overall results indicated that greater engagement with digital marketing increased young adults' attitudes and subjective norms related to energy drinks and decreased PBC over energy drink use. In this model, TPB constructs mediated the relationship between engagement with digital marketing and energy drink use.

DISCUSSION

The findings suggested that young adults' engagement with digital marketing for energy drinks was associated with their use of these products. Engagement with digital marketing was more strongly related to energy drink use than exposure to or engagement with other marketing activities. The relationship between engagement with digital marketing and energy drink use was mediated by TPB constructs including attitudes, subjective norms, and PBC about these products.

The current study adds to the literature on the potential negative health implications of digital marketing on young adults[10,11,13] and

Table 2. Stepwise Regression Analyses Predicting Energy Drinks Use From Exposure to and Involvement in Digital as Well as Other Types of Marketing Activities

Predictors	Adjusted Odds Ratio (Confidence Interval 95%)	*P* for Each Variable	Multivariate Coefficient	*P* for Model
Step 1			0.12	.15
Exposure to other marketing	1.04 (0.60–1.81)	.89		
Step 2			0.14	.13
Exposure to other marketing	0.83 (0.43–1.59)	.58		
Exposure to digital marketing	1.35 (0.86–2.10)	.19		
Step 3			0.17	.05
Exposure to other marketing	0.82 (0.43–1.59)	.56		
Exposure to digital marketing	1.23 (0.78–1.95)	.37		
Engagement with other marketing	1.56 (1.03–2.35)	.04*		
Step 4			0.21	.02*
Exposure to other marketing	0.79 (0.40–1.53)	.45		
Exposure to digital marketing	1.08 (0.67–1.75)	.78		
Engagement with other marketing	1.43 (0.93–2.20)	.10		
Engagement with digital marketing	1.47 (1.02–2.10)	.04*		

*$P < .05$.

Notes: After controlling for block 1: demographic variables (age, gender, socioeconomic status level, student status, and work status); block 2: significant others' (parents', partners', friends', or siblings') acceptance of their energy drink use (okay or not okay).

provides evidence that digital marketing may be more strongly related than other marketing to unhealthy food behavior consumption, especially if young adults engage with digital marketing content. These findings were consistent with a similar study on the effects of marketing on heavy alcohol use among young adults,[10] which found that engagement with digital marketing had a stronger association with heavy alcohol use than mere exposure to either digital or nondigital marketing.

The findings also confirmed that engagement with digital marketing activities was more strongly related to

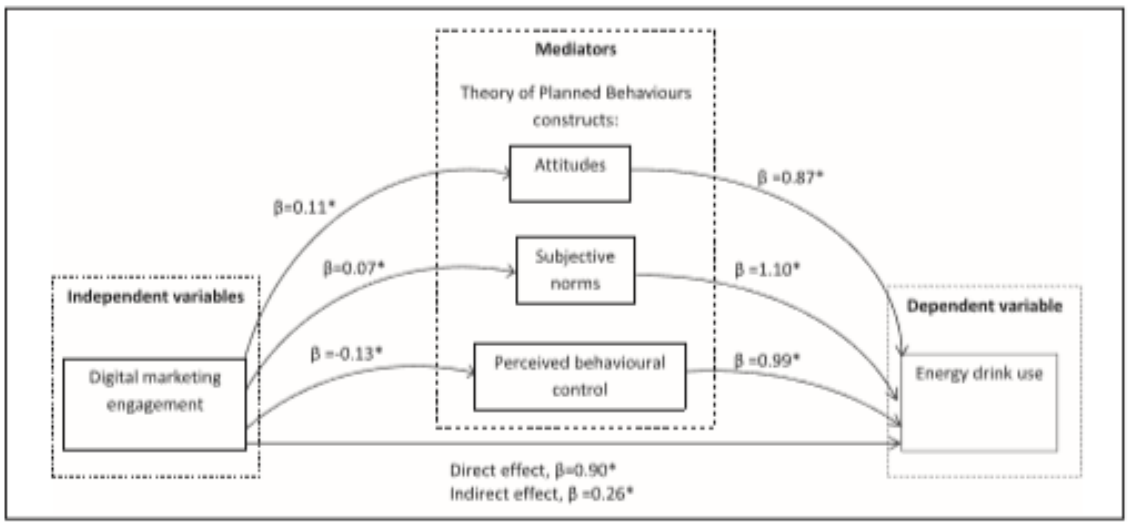

Figure 2. Mediating effects of Theory of Planned Behavior Constructs in the relationship between digital marketing and energy drink use.

food-related behaviors than mere exposure.[10,34,35] This can be explained by the marketing receptivity notion that an individual's attitudinal responsiveness to marketing content begins with passive marketing exposure (eg, saw an advertisement on Facebook) and progresses to more active engagement (eg, clicked on the advertisement on Facebook).[36] It was suggested that an individual was more influenced by marketing content as the receptivity level increased. Although engagement with digital marketing was found to be the strongest variable linked to energy drink use, the reported engagement rate with digital marketing activities in the current study was low, ranging from 11% to 43% of participants (Table 2). This finding shows the powerful impact of digital marketing on young adults; even low levels of participation were associated with unhealthy product use.

The findings that attitudes, subjective norms, and PBC mediate the relationship between engagement with digital marketing and energy drink use raise several interesting points. First, the mediation by attitudes may be attributed to the relationship between young people's attitudes toward digital marketing[37] or their attitudes toward energy drink use.[38] Marketing research showed that the greater the Internet use was among young people, the more likely it was that they developed favorable attitudinal responses toward marketing communications on digital channels.[37] Second, the significant mediation roles that attitudes and subjective norms had in the relationship between digital marketing and energy drink use may be explained by young people's attitudes toward these products and their perceived norms of energy drink use. Although participants' nutrition knowledge was not measured in this study, previous literature documented that young people with lower nutrition knowledge were more likely to consume these products than were nonusers.[39] Strengthening nutrition education among this age group may be a way to change young people's attitudes toward these drinks. Young people were also reported to view energy drink use as a way to shape their social image within their peer group.[38] The peer endorsement function on social media,[17] such as exposure to marketing messages when friends like a brand's page, may have enhanced the subjective norms of energy drink use among young adults.

The current study showed that engagement with digital marketing weakened young adults' PBC over energy drink use. This finding aligns with an experimental study showing that marketing on digital media was effective in persuading young adults to purchase and consume energy drinks.[13] The variations in PBC over energy drink use may lead to differences in the effects of digital marketing. This could be explored among young adults with different education levels and from different socioeconomic backgrounds. Interventions to enhance self-efficacy to make healthful dietary choices are essential for this age group.

Interpretation of the findings from this study is subject to several limitations. First, the study used 1 beverage product category as an example; future studies are needed to compare the effects of digital marketing with other marketing on a broader range of food and beverage products. Second, the measure in this study was only a brief, cross-sectional survey developed by the researchers, and although it was based on previous marketing and energy drink–related literature,[10,13] it was not formally validated. Third, the sample in this study was mainly composed of university students, which limited the generalizability of the findings to other populations. Fourth, although the regression model showed that engagement with other forms of marketing was not a significant predictor of energy drink use, the high odds ratio and wide CI indicated that this variable might become significant with a greater sample size. Finally, the cross-sectional data may not reflect mediation effects accurately, although mediation analysis was undertaken on cross-sectional data in previous studies.[29,40]

IMPLICATIONS FOR RESEARCH AND PRACTICE

Findings from this study contribute to a growing body of evidence suggesting that digital marketing is negatively linked to young adults' food-related behaviors and is more strongly associated with these behaviors than other forms of marketing. This finding could be explored further in future research that examines food-related behaviors, especially among young adults who spend a significant amount of time on the Internet. Public health professionals have advocated stronger regulations on unhealthy food and beverage promotion to children, especially via traditional media. Such public health advocacy could be expanded to include the restriction of unhealthy online marketing and the impacts of such marketing on adults. Restricting the marketing of unhealthy food and nonalcoholic beverages to young adults could be more challenging than restricting such marketing to children given that members of this age group are legally responsible for their behavior. However, young adults' unhealthy behaviors require public health attention. This study identified that digital marketing was effective in promoting unhealthy consumption among young adults. Although food and nonalcoholic beverages are legal commodities, high rates of noncommunicable diseases globally highlight the need to focus on and potentially restrict the ever-expanding marketing strategies within the online environment. For health interventions, digital marketing is an important target for reducing unhealthy consumption among young adults. Findings from this study suggest that the negative impacts of digital marketing require consideration for inclusion in future interventions that focus on strategies to attenuate young adults' attitudes toward certain products,

denormalize unhealthy consumption patterns, and strengthen self-efficacy to decrease the attraction of unhealthy foods to this age group.

ACKNOWLEDGMENTS

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SUPPLEMENTARY DATA

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jneb.2018.05.022.

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Appendix D: The decision letter from Journal regarding the accepted thematic content analysis manuscript

28-Aug-2018

Dear Ms Buchanan

It is a pleasure to accept your manuscript entitled "A thematic content analysis of how marketers promote energy drinks on digital platforms to young Australians" for publication in Australian & New Zealand Journal of Public Health.

Please note that your article cannot be published until the appropriate publication fee has been paid and a licence agreement has been signed by the corresponding author.

In the next few weeks an email will be sent from the Wiley Author Services system to invite the corresponding author to log in and compete the appropriate licence agreement.

If your paper incurs a publication fee, PHAA will issue an invoice to the first author using the contact details provided at submission. If this is NOT correct and another person/institution is to be invoiced for this manuscript's publication fee, please email operations@phaa.net.au as soon as possible with the correct information, quoting your manuscript number.

Although the manuscript is accepted the files will now be checked to ensure that everything is ready for publication, and you may be contacted if we have any queries.

On behalf of the Editors of Australian & New Zealand Journal of Public Health, we look forward to your continued contributions to the Journal.

Sincerely,

Peta Neilson
Australian & New Zealand Journal of Public Health

on behalf of
ANZJPH Editors
Professor John Lowe (Editor-in-Chief)
Dr Nikki Percival
Dr Priscilla Robinson
Dr Melissa Stoneham
Dr Sandar Tin Tin
A/Prof Luke Wolfenden
Dr Hassan Vally

Appendix E: Abstract presented at the Faculty of Social Sciences HDR Conference

Limin Buchanan
School of Health & Society

Biography

Limin Buchanan is a first year PhD student from School of Health and Society. Her supervisors are Prof Heather Yeatman and Dr Bridget Kelly. Limin has a background in Nutrition and has a strong interest in Public Health especially in foods impact on health and well-being.

Digital marketing and its influences on young people: Energy drinks as a case study

Literature suggests food and beverage marketing influences individuals' food preferences, purchases and consumption behaviour. Market research notices a growing number of marketing activities undertaken on the digital platforms, a shift from the traditional broadcast media like television and newspaper. Food and beverage industry marketers are increasingly promoting their products on websites, social network sites, and in online games. Such digital marketing activities are particularly appealing to digital savvy teenagers and young adults.

Limited studies have been conducted to investigate the impact of digital food and beverage marketing on young people's consumption behaviour. This project will explore the influences of digital marketing on young Australian's consumption behaviours using a newly developed conceptual framework that incorporates aspects of the Theory of Planned Behaviour and Consumer Socialisation. Energy drinks, beverages that contain high amounts of caffeine, sugar and stimulants, will be used as a case study as they are often marketed towards young people using digital technologies. Important outcomes of the project will be to inform policy makers' actions in establishing marketing and advertising regulations and policies that are appropriate to digital platforms and to inform regulation of energy drinks.

Appendix F: Presentation the Emerging Health Policy Research Conference in Charles Perkins Centre

Emerging Health Policy Research Conference Program

Wednesday, 13 July 2016

1 pm	**Public Policy**		1 pm	**Chronic Disease**		1 pm	**Quality and Safety**	
Chair:	**Dr Anne-marie Boxall,** Director, Health Systems Policy Division, Commonwealth Department of Health, and Adjunct Lecturer, Menzies Centre for Health Policy		**Chair:**	**Adjunct Associate Professor Freddy Sitas,** Menzies Centre for Health Policy		**Chair:**	**Professor Andrew Wilson, Director,** Menzies Centre for Health Policy	
Venue:	CPC Seminar Room 1.1		Venue:	CPC Seminar Room 1.2		Venue:	CPC Seminar Room 1.3	
1.00	Arnagretta Hunter *Calvary Hospital ACT*	The Heart of the Matter: Influence of Health in Public Policy	1.00	Claire Pearce *The Australian Prevention Partnership Centre (TAPPC) and ACT Health Chronic Disease Management Unit, ACT Health*	Why aren't health professionals telling us we're fat?	1.00	Jane Bell *Menzies Centre for Health Policy, University of Sydney*	Evidence for the safety and quality of children's medications
1.15	Emily Riley *Menzies Centre for Health Policy, University of Sydney*	Environmental Assessment of major transport infrastructure: where does health fit?	1.15	Elly Howse *School of Public Health, Sydney Medical School and Charles Perkins Centre, University of Sydney*	Universities, young adults and chronic disease prevention	1.15	Deborah Schaler *Menzies Centre for Health Policy, University of Sydney*	Patient feedback – the missing link in patient safety intelligence.
1.30	Sancia West *Centre for Rural Health, University of Tasmania*	Politics, policy and patients: Cancer services in North West Tasmania	1.30	Amanda Ampt *Menzies Centre for Health Policy, University of Sydney*	Incidence of childhood Type 1 diabetes, and rate of ketoacidosis	1.30	Richa Jaswal *Manipal University, Manipal India*	Rational Use of Medicines in Public Health Facilities of Tamil Nadu, India, A prescription Analysis
1.45	**Group Discussion**		**1.45**	**Group Discussion**		**1.45**	**Group Discussion**	
2 pm	**Media & Public Policy**		**2 pm**	**Research Translation**		**2 pm**	**Primary Health Care & Workforce**	
Chair:	**Professor Don Nutbeam,** Sydney School of Public Health, University of Sydney		**Chair:**	**Adjunct Associate Professor Mary Haines,** Senior Advisor, Sax Institute		**Chair:**	**Dr Cathie Hull,** Clinical Senior Lecturer, Menzies Centre for Health Policy	
Venue:	CPC Seminar Room 1.1		Venue:	CPC Seminar Room 1.2		Venue:	CPC Seminar Room 1.3	
2.00	Samantha Rowbotham *Menzies Centre for Health Policy, University of Sydney and The Australian Prevention Partnership Centre (TAPPC)*	Media framing of preventive health messages: A scoping review	2.00	Gabriel Moore *The Sax Institute and The University of Sydney*	How do knowledge brokers assist policymakers to commission rapid reviews?	2.00	Susan Clarke *Menzies Centre for Health Policy, University of Sydney*	General Practice and Gatekeeping in the Australian Health System.
2.15	Tala Barakat *Menzies Centre for Health Policy, University of Sydney and The Australian Prevention Partnership Centre (TAPPC)*	Corrupting the Nanny State. Content Analysis - Sydney Lockout Laws	2.15	Abby Haynes *CIPHER, Sax Institute*	Policymakers' experience of a research utilisation intervention: a realist analysis	2.15	Michael Wright *Centre for Health Economics Research and Evaluation (CHERE), University Technology Sydney (UTS)*	Continuity of Care without Patient Enrolment
2.30	Limin Buchanan *Early Start Research Institute, University of Wollongong*	Digital marketing of unhealthy beverage – how do young adults respond?	2.30	Alexandra Kilian *McMaster University*	Jurisdictional scans in policymaking: a critical interpretive synthesis	2.30	Anthea Dallas *University of Notre Dame, Sydney*	Curriculum transplantation - the answer to global health education?
2.45	**Group Discussion**		**2.45**	**Group Discussion**		**2.45**	**Group Discussion**	

3 - 3.30 pm **Afternoon Tea**

Appendix F: Abstract presented at the 44th Annual and 20th Chronic Diseases Network Conference

Digital marketing of unhealthy food products – how do young adults respond?

Presenter: Limin Buchanan

Authors: Ms Limin Buchanan[1], Professor Heather Yeatman[1], Dr Bridget Kelly[1]

Affiliations: [1]*University of Wollongong, Wollongong, Australia*

Abstract:

Background: Young adults experience faster weight gain and consume more unhealthy food than any other age group. The impact of online food marketing on "digital native" young adults is unclear. This study examined the effects of online marketing on young adults' consumption behaviours, using energy drinks as a case example. The elaboration likelihood model of persuasion was used as the theoretical basis.

Methods: A pre-test post-test experimental research design was adopted using mixed-methods. Participants (aged 18-24) were randomly assigned to control or experimental groups (N= 30 each). Experimental group participants' familiarity, attitude towards, and intended purchase and consumption of energy drinks were examined via surveys and semi-structured interviews after their exposure to two popular energy drink brands' websites and social media sites (exposure time 8 minutes).

Results: Experimental group participants showed more positive attitudes towards energy drinks than the control group after the experiment. Pre-/post-test comparison showed that the exposure improved experimental group participants' attitudes towards, and purchase intention of the two test energy drinks brands. Their attitude towards energy drink products in general also improved. The experiment produced no obvious impact on their intended consumption of energy drinks.

Conclusion: This study indicates the influential power of unhealthy online marketing on cognitively mature young adults. This study draws public health attention to young adults; previous research attention has been on the vulnerable young children but clearly young adults are also impacted. Counter advertising or assistance from digital media channels may mitigate some of the effects of unhealthy digital food marketing.

Appendix G: Presentation at the 15th World Congress on Public Health 2017

1 February 2017

Ref: 4211

Dear Limin,

Thank you for registering for the 15th World Congress on Public Health 2017 to confirm your participation in the program.

Details for your **Oral presentation** at the congress are outlined below.

Details	
Title:	**Exposure To Digital Marketing Enhances Young Adults' Interest In Energy Drinks: An Exploratory Investigation**
Presentation Time:	1330 - 1342
Order:	1.00
Session Details:	OR65 - Digital technology and social media Wednesday, April 5 2017 1330 - 1530
Room:	Meeting Room 106

Below is information relating to your oral presentation:

- As a courtesy to other speakers in your session and to ensure the program runs to time, please keep your presentation to no more than **10 minutes** with 2 minutes for questions. Your session chair will provide time alerts and direct the questions.
- Speakers are requested to report to the speaker preparation room at least 3 hours before their scheduled presentation with their presentation on a USB to allow sufficient time to upload and check their audiovisual presentations with the technician.
- **Please note that the preferred screen ratio for Powerpoint presentations is 16:9.**
- Please go to your allocated room 15 minutes before the session start time to meet with the Session Chair and familiarise yourself with the room and AV.

Attached is a document with some further details in regards to your presentation.

Please do not hesitate to contact us if you need clarification on any part of this letter, or the congress in general.

We look forward to your participation at the WCPH 2017!

WCPH 2017 Secretariat

PO Box 3599
South Brisbane QLD 4101
AUSTRALIA
Ph: +61 7 3255 1002
Fax: +61 7 3255 1004
E: abstracts@wcph2017.com

Appendix G: Abstract presented at the Public Health Prevention Conference 2018

6B Perceptions and Attitudes

Hans Heysen Room, 9:00am - 10:30am

The effect of digital marketing of unhealthy commodities: a Systematic Review

Presenter: Limin Buchanan

Authors: Ms Limin Buchanan[1], Dr Bridget Kelly[1], Professor Heather Yeatman[1], Dr Kishan Kariippanon[1]

Affiliations: [1]*University of Wollongong, Wollongong, Australia*

Abstract:

Introduction: The marketing of unhealthy commodities through traditional media is known to impact consumers' product attitudes and behaviours. Less is known about the impacts of digital marketing, especially among young people who have a strong online presence. This review systematically assesses the relationship between digital marketing and young people's attitudes and behaviours towards unhealthy commodities.

Methods: Literature was identified in June 2017 by searches in six electronic databases from 1990 to 2017. Primary studies that examined the effect of exposure to, or engagement with, digital marketing of unhealthy food or beverages, alcohol and tobacco products on young people's (12 to 30 years) attitudes, intended and actual consumption were reviewed.

Results: 28 relevant studies were identified. The reviewed studies were mainly cross-sectional studies; a few were longitudinal, experimental and qualitative studies. Significant detrimental effects of digital marketing on the intended use and actual consumption of unhealthy commodities were revealed in the majority of the included studies. Qualitative findings provided insights that marketers used peer-to-peer transmission of messages on social networking sites to blur the boundary between marketing contents and online peer activities.

Conclusion & Recommendation: Our findings suggested that digital marketing associated with young people's unhealthy commodities use and beliefs. The effects of digital marketing varied between the product types and peer endorsed marketing contents (earned media) may exert more negative impacts than the explicit online advertisements (owned media and paid media. Regulations on digital marketing are needed to prevent a deterioration of unhealthy commodities consumption.

Appendix H: Newsletter in In-Touch regarding PhD research

Energy Drinks and Young Australians

Limin Buchanan, PhD Student, University of Wollongong

Limin Buchanan

I am a new PhD student at University of Wollongong. I have a background in Nutrition, and have successfully completed Honours research in Public Health Nutrition with First Class Honours. In the past few years, I have been working as a Research Assistant/Project Officer for numerous Public Health, Public Health Nutrition and Curriculum research projects. I also have work experience as a Health Promotion Officer at Kiama Municipal Council. I have just started PhD in early March, and my topic is about the marketing and regulations of Energy Drinks and their impact on consumption patterns among younger Australians. My supervisors are Associate Professor Samantha Thomas, Dr Bridget Kelly, and Professor Heather Yeatman.

Energy drinks such as V, Red Bull, Monster, Rockstar and Mother have experienced impressive growth both in Australia and Internationally. These drinks are often marketed to increase alertness, stamina, and performance and are particularly popular among people with busy lifestyles, athletes, teenagers and young adults who often need 'a boost'. However, the high caffeine, sugar, as well as other stimulant ingredients in energy drinks has raised public health concern; research suggests that these drinks may have adverse health outcomes, particularly in children, adolescents, and young adults. These include increased blood pressure, anxiety, chronic episodic headaches, insomnia, vomiting and panic attacks. Health impacts are even worse when adding alcohol to energy drinks, a common practice among young party-goers. Evidence suggests that caffeine and other stimulants in energy drinks mask the intoxicating effects of alcohol and may lead to increased consumption and risk-taking behaviours.

The marketing of energy drinks are often done 'below the line'- through Internet, social media platforms, direct-to-consumer promotions at night-clubs, pubs and music or sports events. Energy drink brands closely align their products with extreme sports, music festivals which increase the appeal of their products to young people. With the rising popularity of energy drinks and with more health problems reported worldwide, there have been increased calls for stricter regulations in relation to the labelling of drinks, and the age at which individuals can purchase these drinks. For example, the Country Women's Association NSW and the Australian Medical Association have thrown their support in urging Government to ban the sale of energy drinks to children under 18 years old. To date, there is paucity of research on how the marketing strategies of energy drinks influence the consumption pattern among young Australians and how the marketing and advertising practices of energy drink are regulated in Australia. My PhD project will investigate the marketing channels and techniques utilised by the energy drink industry to influence attitudes towards, and consumption patterns of, these drinks in younger Australians and investigate the current regulatory frameworks and policies associated with energy drinks in Australia and Internationally. By doing this project, I am hoping to explore the role of effective public health policy strategies in mitigating the potential risks posed by the marketing of energy drinks in Australia.

Appendix I: Alice Springs News regarding presentation at conference

Limin Buchanan **(at left)** gives a snappy account of "Digital marketing of unhealthy food products – how do young adults respond?"

Keenly, is the short answer.

Digital platforms can be a tool for purchasing food anywhere, anytime.

Once you're mobile phone has disclosed your location the nearest outlet of energy drinks ("high in caffein, sugar and stimulants, known to increase blood pressure, even cause heart attacks") or pizzas or whatever can target you with their pitch.

And do the same, automatically, next time you're in that area.

Social media ads are cheaper than TV.

And the ads are less regulated: Booze and tobacco commercials can fly under the regulations radar.

And they can get to children. They are always on Facebook, aren't they?

The pitch for the one drink that gives you wings is that it's also environmentally friendly: You can recycle the cans! And the makers sponsor a lot of sport! Wow!

Ms Buchanan invites her audience to imagine a young person moving into her or his own home, having spent very much of their young life on their mobile or some other "invasive" digital device and hardly any time at all learning to cook and shop for healthy stuff.

Bring 'em on, say the junk food pushers.

Keynote speakers tomorrow are Donna Ah Chee, CEO of the Central Australian Aboriginal Congress, and Justin Mohamed, the Chief Executive Officer of Reconciliation Australia, whose vision is "to create a more just, equitable and reconciled Australia through key programs and initiatives".

Appendix J: Illawarra Mercury News regarding PhD publication

V Energy Drink.

Young adults are easily being won over by fatty foods and sugary drinks because of online ads targeting them 24 hours a day, new research reveals.

A University of Wollongong study used energy drinks to look at behaviour changes in 18 to 24-year-olds ("digital natives") after they were exposed to marketing on Facebook and websites.

The study's authors said the results highlight the need to change Australian advertising codes because currently digital platforms aren't covered despite being highly pervasive.

"Our study highlights the need to strengthen regulatory policies relating to online environments. Due to their strong online presence and the pervasive yet less scrutinised marketing activities on digital platforms, it is likely that they (young adults) have been exposed to all sorts of marketing activities online," said PhD student Limin Buchanan from UOW's School of Health and Society.

"The current marketing and advertising code in Australia does not cover digital media and young adults over 18 years old are certainly not protected by any regulations.

"Greater understanding of how online marketing influences young adults' attitudes and behaviours can inform public health professionals to come up with strategies to counteract the unhealthy food marketing activities online."

Data from the Australian National Health Survey 2014–15 indicated that approximately 39 per cent of young adults were overweight or obese and consumed more unhealthy food and beverages than any other age groups.

Appendix K: Media Release on the University of Wollongong webpage regarding PhD publication

Media Releases

22/03/2017

Digital marketing enhancing unhealthy choices

Research finds unhealthy advertising flies under the radar.

Exposure to online marketing for unhealthy products could have a detrimental impact on young adults, according to researchers from the University of Wollongong (UOW).

A recently released study, entitled 'Exposure to digital marketing enhances young adults' interest in energy drinks: An exploratory investigation', examined the effects of online marketing on the consumption behaviours of young adults, using energy drinks as a case example.

The research, undertaken by PhD student Limin Buchanan, Dr Bridget Kelly and Professor Heather Yeatman from UOW's School of Health and Society, targeted young adults aged 18-24 years of age – a group who consume more unhealthy food than any other age group (Data: Australian National Health Survey).

Through surveys and semi-structured interviews, researchers were able to gain an understanding of young people's attitudes towards energy drinks, conducting controlled exposure to the websites and social media sites of two popular energy drinks for a period of time and comparing test results to a control group.

PhD student Limin Buchanan from UOW's School of Health and Society said the research clearly demonstrates the impact of online marketing on young adults.

"After a short exposure to digital marketing materials, participants had a better impression of, greater purchase intention and were more likely to consume energy drinks," she said.

“Our findings suggest that although young adults realised the online materials were designed to promote energy drink products, they were not necessarily capable to defend themselves against marketing content such as the brands’ community involvement, contribution to charities, and environmentally friendly efforts. Young adults also valued the ‘honesty’ of the brands by declaring the contents of their drink.

“Surprisingly, we found that central cues, such as corporate social responsibility as demonstrated by the brands, had greater impacts on the young adults than emotional appeals."

Limin said one of the key takeaways from the study was the need for better regulatory measures to be put in place to protect young consumers.

“Many people have access to the Internet 24/7 through their smart phone, which means we are being exposed to online marketing content all the time. Our smart phones know where we are, what we like; and subsequently marketers use our personal data to promote things that we may be interested in," she said.

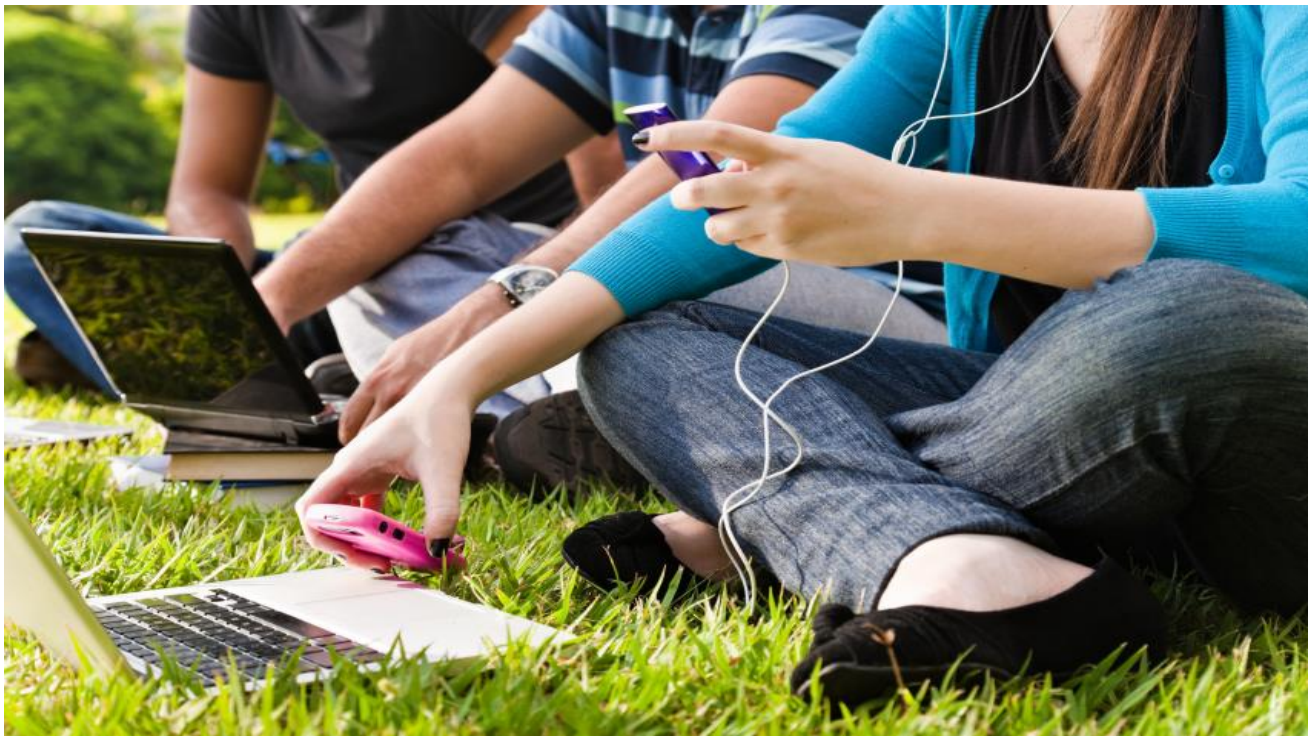
“Greater understanding of how online marketing influences young adults’ attitudes and behaviours can inform public health professionals to come up with strategies to counteract the unhealthy food marketing activities online.

“Our study highlights the need to strengthen regulatory policies relating to online environments. Due to their strong online presence and the pervasive yet less scrutinised marketing activities on digital platforms, it is likely that they (young adults) have been exposed to all sorts of marketing activities online.

“The current marketing and advertising code in Australia does not cover digital media and young adults over 18 years old are certainly not protected by any regulations."

The research paper was published in PLOS ONE.

Appendix L: Flyer for participants recruitment for the exposure experiment



YOUNG ADULTS (18-24 YEARS) NEEDED!!

- **To surf the Internet**
- **To play online games**
- **To answer a few questions**

Not too hard, yeah???

iTunes & Coles gift vouchers for eligible participants

30 minutes is all the time needed

To see if you're eligible, please email limin@uow.edu.au or ring .

This study is conducted by Professor Heather Yeatman, Dr Bridget Kelly and Ms Limin Buchanan from the School of Health and Society, Faculty of Social Sciences.

PARTICIPATION IS VOLUNTARY AND CONFIDENTIAL

UNIVERSITY OF WOLLONGONG

Appendix M: Pre-test survey for the exposure experiment

Participant Number: _____ *Date:* _____

PRE-TEST SURVEY

This questionnaire is part of a study of food-related Internet sites. Your participation in this study is voluntary and anonymous.

1. Gender:
   ☐ Male
   ☐ Female

2. Age: _____ Years

3. What is the highest level of education you have completed or are currently undertaking?
   ☐ None
   ☐ Primary school
   ☐ High school or equivalent
   ☐ TAFE qualification or equivalent
   ☐ Bachelor's degree
   ☐ Postgraduate qualification
   ☐ Other, please specify _____
   a) If you are a university or TAFE student, what course/s are you currently undertaking?
      _____

4. How often do you access the Internet?
   ☐ Once a month or less
   ☐ Once a week
   ☐ Several times a week
   ☐ Every day
   ☐ Several times a day

5. Each time you get online, approximately how much time do you spend on the Internet?
   ☐ Less than 15 minutes
   ☐ 15 minutes to less than 30 minutes
   ☐ 30 minutes to less than one hour
   ☐ More than one hour

6. When you access the Internet, which of the following do you usually do? (can select more than one answer)
   - ☐ Check or send emails
   - ☐ Play online games
   - ☐ Download music or video
   - ☐ Use chat rooms
   - ☐ Use web for school or work purposes
   - ☐ Log on to Facebook
   - ☐ Watch video on YouTube
   - ☐ Check Tweets or use Twitter
   - ☐ Online shopping
   - ☐ Read news
   - ☐ Use other computer applications. Please specify _____

7. Which of the following website topics are of interest to you? (can select more than one answer)
   - ☐ Food and beverage
   - ☐ Games
   - ☐ Music/Film/Celebrity
   - ☐ News
   - ☐ Sports
   - ☐ Educational/school
   - ☐ Others, please specify _____

8. How familiar are you with these brands:

	Never heard of it	Aware of it but have never eaten/drunk it	Aware of it but have never eaten/drunk it, and would like to try it	Eat/drink it sometimes	Eat/drink it on a regular basis
Uncle Tobys' muesli bar	☐	☐	☐	☐	☐
Kellogg's corn flakes bar	☐	☐	☐	☐	☐
Carman's nut bar	☐	☐	☐	☐	☐
Go Natural's nut bar	☐	☐	☐	☐	☐
Coca-cola	☐	☐	☐	☐	☐
Schweppes	☐	☐	☐	☐	☐
Red Bull	☐	☐	☐	☐	☐
V Energy	☐	☐	☐	☐	☐

9. How familiar in general are you with:

	Never heard of it	Aware of it but have never eaten/drunk it	Aware of it but have never eaten/drunk it, and would like to try it	Eat/drink it sometimes	Eat/drink it on a regular basis
Muesli bars	☐	☐	☐	☐	☐
Nut bars	☐	☐	☐	☐	☐
Soft drinks	☐	☐	☐	☐	☐
Energy drinks	☐	☐	☐	☐	☐

10. Please circle the number which seems most close to how you would describe:

V Energy	Never heard of it ☐	Bad	1	2	3	4	5	6	7	Good
		Unfavourable	1	2	3	4	5	6	7	Favourable
		Unappealing	1	2	3	4	5	6	7	Appealing
		Likeable	1	2	3	4	5	6	7	Unlikeable
		Pleasant	1	2	3	4	5	6	7	Unpleasant
Uncle Tobys' muesli bar	Never heard of it ☐	Bad	1	2	3	4	5	6	7	Good
		Unfavourable	1	2	3	4	5	6	7	Favourable
		Unappealing	1	2	3	4	5	6	7	Appealing
		Likeable	1	2	3	4	5	6	7	Unlikeable
		Pleasant	1	2	3	4	5	6	7	Unpleasant
Red Bull	Never heard of it ☐	Bad	1	2	3	4	5	6	7	Good
		Unfavourable	1	2	3	4	5	6	7	Favourable
		Unappealing	1	2	3	4	5	6	7	Appealing
		Likeable	1	2	3	4	5	6	7	Unlikeable
		Pleasant	1	2	3	4	5	6	7	Unpleasant
Carman's nut bar	Never heard of it ☐	Bad	1	2	3	4	5	6	7	Good
		Unfavourable	1	2	3	4	5	6	7	Favourable
		Unappealing	1	2	3	4	5	6	7	Appealing
		Likeable	1	2	3	4	5	6	7	Unlikeable
		Pleasant	1	2	3	4	5	6	7	Unpleasant
Go Natural's nut bar	Never heard of it ☐	Bad	1	2	3	4	5	6	7	Good
		Unfavourable	1	2	3	4	5	6	7	Favourable
		Unappealing	1	2	3	4	5	6	7	Appealing
		Likeable	1	2	3	4	5	6	7	Unlikeable
		Pleasant	1	2	3	4	5	6	7	Unpleasant

11. Regardless of brands, please circle the number which seems most close to how you would describe:

Nut bars	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
Energy drinks	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant

12. Assume that you are looking for a snack/drink and money is not concern, how you would describe your intention to purchase:

	Definitely will not purchase	Probably will not purchase	Not sure	Probably will purchase	Definitely will purchase
V Energy	☐	☐	☐	☐	☐
Uncle Toby's muesli bar	☐	☐	☐	☐	☐
Red Bull	☐	☐	☐	☐	☐
Carman's nuts bar	☐	☐	☐	☐	☐
Go Natural's nut bar	☐	☐	☐	☐	☐
Nut bar *(regardless of brand)*	☐	☐	☐	☐	☐
Energy drink *(regardless of brand)*	☐	☐	☐	☐	☐

Thank you for completing this survey.

Appendix N: Post-test survey (Experimental group) for the exposure experiment

Participant Number: _____ *Date:* _____

POST-TEST SURVEY

1. How familiar are you with:

	Never heard of it	Aware of it but have never eaten/drunk it	Aware of it but have never eaten/drunk it, and would like to try it	Eat/drink it sometimes	Eat/drink it on a regular basis
Red Bull	☐	☐	☐	☐	☐
V Energy	☐	☐	☐	☐	☐
Energy drinks *(regardless of brand)*	☐	☐	☐	☐	☐

2. Please circle the number which seems most close to how you would describe:

Red Bull	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
V Energy	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant

Energy drinks *(regardless of brand)*	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant

3. Assume that you are looking for a snack/drink and money is not concern, how you would describe your intention to purchase:

	Definitely will not purchase	Probably will not purchase	Not sure	Probably will purchase	Definitely will purchase
Red Bull	☐	☐	☐	☐	☐
V Energy	☐	☐	☐	☐	☐
Energy drinks *(regardless of brand)*	☐	☐	☐	☐	☐

4. a) If in the pre-test survey, you indicated that you don't consume energy drinks: After the experiment today, would you agree with what you said before or would you like to change it?

   ☐ Agree with what I said before

   ☐ Would like to change it

   OR

b) If in the pre-test survey, you indicated that you do consume energy drink: After the experiment today, would you:

Continue to consume energy drink	Strongly disagree	1	2	3	4	5	Strongly agree
Encourage others to consume energy drink	Strongly disagree	1	2	3	4	5	Strongly agree
Consume energy drink more often than before	Strongly disagree	1	2	3	4	5	Strongly agree

Thank you for participating in the study.

Appendix O: Post-test survey (Control group) for the exposure experiment

Participant Number: _____ *Date:* _____

POST-TEST SURVEY

1. How familiar are you with:

	Never heard of it	Aware of it but have never eaten/drunk it	Aware of it but have never eaten/drunk it, and would like to try it	Eat/drink it sometimes	Eat/drink it on a regular basis
Carman's nut bar	☐	☐	☐	☐	☐
Go Natural's nut bar	☐	☐	☐	☐	☐
Nut bars *(regardless of brand)*	☐	☐	☐	☐	☐
Red Bull	☐	☐	☐	☐	☐
V Energy	☐	☐	☐	☐	☐
Energy drinks *(regardless of brand)*	☐	☐	☐	☐	☐

2. Please circle the number which seems most close to how you would describe:

Carman's nut bar	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant

Go Natural's nut bar	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
Nut bars *(regardless of brand)*	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
Red Bull	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
V Energy	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable
	Pleasant	1	2	3	4	5	6	7	Unpleasant
Energy drinks *(regardless of brand)*	Bad	1	2	3	4	5	6	7	Good
	Unfavourable	1	2	3	4	5	6	7	Favourable
	Unappealing	1	2	3	4	5	6	7	Appealing
	Likeable	1	2	3	4	5	6	7	Unlikeable

	Pleasant	1	2	3	4	5	6	7	Unpleasant

3. Assume that you are looking for a snack/drink and money is not concern, how you would describe your intention to purchase:

	Definitely will not purchase	Probably will not purchase	Not sure	Probably will purchase	Definitely will purchase
Carman's nut bar	☐	☐	☐	☐	☐
Go Natural's nut bar	☐	☐	☐	☐	☐
Nut bars *(regardless of brand)*	☐	☐	☐	☐	☐
Red Bull	☐	☐	☐	☐	☐
V Energy	☐	☐	☐	☐	☐
Energy drinks *(regardless of brand)*	☐	☐	☐	☐	☐

4. a) If in the pre-test survey, you indicated that you don't eat nut bar: After the experiment today, would you agree with what you said before or would you like to change it?
   ☐ Agree with what I said before
   ☐ Would like to change it

   OR

b) If in the pre-test survey, you indicated that you do eat nut bar: After the experiment today, would you:

Continue to eat nut bar	Strongly disagree	1	2	3	4	5	Strongly agree
Encourage others to eat nut bar	Strongly disagree	1	2	3	4	5	Strongly agree
Eat nut bar more often than before	Strongly disagree	1	2	3	4	5	Strongly agree

5. a) If in the pre-test survey, you indicated that you don't consume energy drinks: After the experiment today, would you agree with what you said before or would you like to change it?

☐ Agree with what I said before

☐ Would like to change it

OR

b) If in the pre-test survey, you indicated that you do consume energy drink: After the experiment today, would you:

Continue to consume energy drink	Strongly disagree	1	2	3	4	5	Strongly agree
Encourage others to consume energy drink	Strongly disagree	1	2	3	4	5	Strongly agree
Consume energy drink more often than before	Strongly disagree	1	2	3	4	5	Strongly agree

Thank you for participating in the study.

Appendix P: Post-test semi-structure interview guide (Experimental group)

Introduction

Thank you for taking part in the study today. Before we start the interview, I'd like to remind you that if there is anything that you'd prefer not to answer, please let me know. In case I miss writing anything down, I'd like to audio record this interview. Is this ok with you? [If not, turn off the recorder].

SECTION A: Food and beverage preferences

[Show participants a poster with photos of a range of food and beverage products]

I am going to show you a poster with photos of a variety of food and drinks. What would you like to have right now?

SECTION B: Perception of Brands

1. a) When you hear Red Bull, what is the first thing that pops up in your mind?

   b) What you hear V Energy, what is the first thing that pops up in your mind?

2. a) How do you feel about Red Bull and V Energy after visiting their websites?

   b) Would you pay more, less or the same amount of attention to these brands in the future, after looking at their websites?

   (Prompt: Pay more or less attention in what ways? eg. Click/avoid their advertisement links? Or specifically look for/avoid their products in shops? Have the websites left you want to learn more or less about these brands?)

   c) Have or have the websites not change your views about: i) these brands and ii) their drink products? In what ways?

(Prompt: Would you more or less likely to try their products?)

SECTION C: Experience with digital marketing

3. You've just had a look at two websites. Can you please describe the features of the site, including what you thought were good/interesting and what were poor/not so interesting? Let's start with a) Red Bull website, then b) V Energy website.
   (Prompt if necessary: What did you see when you navigated through the site? What links did you click on? Which social media sites did you visit? What did you see?)

4. Can you please tell me about any previous observations or experience you have had with the marketing of a specific food/beverage product on websites? What about for energy drinks specifically? (Prompt if necessary: Can you recall if you have visited website about a specific product before? What prompt you to visit those sites?...)

5. Increasingly advertisements show up on Facebook. Have you noticed this on your newsfeed? How did you feel about them?
   (Prompt if necessary: Have you ever noticed any food/beverage products advertisement on Facebook? What about energy drinks? Did you click on them? Like them? Share them? What is more likely to get your attention or make you engage with it?)

6. Can you please tell me about your experience with the online games?
   (Prompt if necessary: Do you play these? How often?...)
   a) Do you notice any advertising for products when you play online games? How do you feel about these advertisements?

(Prompt if necessary: Was that before or during or after the game? Do you view them as advertisement? Such as brand logo on game's tools….)

SECTION D: Perception of food and beverage products

7. Many young people consume energy drinks. What are your views about them? What would you see as the advantages/good points and disadvantages/not so good points about them?

(Prompt: Have you ever had energy drinks before? What prompt you to drink these drinks? When did you first try energy drinks? In the survey you mentioned that you drink energy drinks, how often? Do friends/ families drink energy drinks? In what occasions? Have you ever mixed alcohol with energy drinks?)

Appendix Q: Post-test semi-structure interview guide (Control group)

Introduction

Thank you for taking part in the study today. Before we start the interview, I'd like to remind you that if there is anything that you'd prefer not to answer, please let me know. In case I miss writing anything down, I'd like to audio record this interview. Is this ok with you? [If not, turn off the recorder].

SECTION A: Food and beverage preferences

[Show participants a poster with photos of a range of food and beverage products]

I am going to show you a poster with photos of a variety of food and drinks. What would you like to have right now?

SECTION B: Perception of Tested Brands

8. a) How do you feel about Carman's and Go Natural after visiting their websites?

   b) Would you pay more or less or the same amount of attention to these brands in the future, after looking at their websites?

   (Prompt: Pay more or less attention in what ways? eg. Click/avoid their advertisement links? Or specifically look for/avoid their products in shops? Have the websites left you want to learn more or less about these brands?)

   c) Have or have the websites not change your views about: i) these brands and ii) their products? In what ways?

   (Prompt: Would you more or less likely to try their products?)

SECTION C: Experience with digital marketing

1. You've just had a look at two websites. Can you please describe the features of the site, including what you thought were good/interesting and what were poor/not so interesting? Let's start with a) Carman's website, then b) Go Natural's website.

2. Can you please tell me about any previous observations or experience you have had with the marketing of a specific food/beverage product on websites? What about for energy drinks specifically? (Prompt if necessary: Can you recall if you have visited website about a specific product before? What prompt you to visit those sites?...)

3. Increasingly advertisements show up on Facebook. Have you noticed this on your newsfeed? How did you feel about them?
   (Prompt if necessary: Have you ever noticed any food/beverage products advertisement on Facebook? What about energy drinks? Did you click on them? Like them? Share them? What is more likely to get your attention or make you engage with it?)

4. Can you please tell me about your experience with the online games?
   (Prompt if necessary: Do you play these? How often?...)
   b) Do you notice any advertising for products when you play online games? How do you feel about these advertisements?
      (Prompt if necessary: Was that before or during or after the game? Do you view them as advertisement? Such as brand logo on game's tools….)

SECTION D: Perception of food and beverage products

5. What are your views about nut bars? What would you see as the advantages/good points and disadvantages/not so good points about them?

Prior to the experiment, we also asked you questions about other food and beverage products. Each participant is allocated to answer follow up questions about one of these items. You are allocated to answer questions about energy drinks.

6. a) When you hear Red Bull, what is the first thing that pops up in your mind?

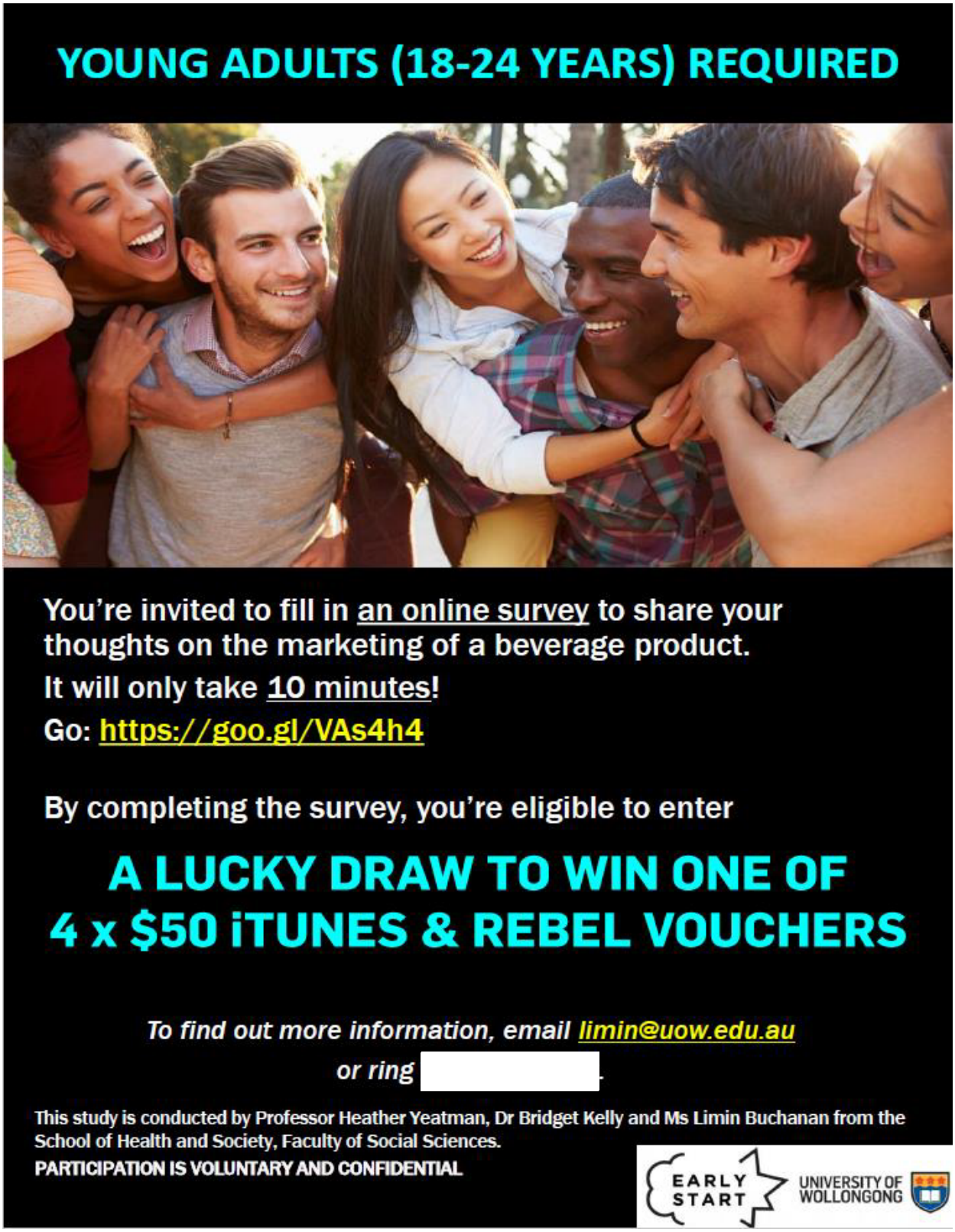
   c) What you hear V Energy, what is the first thing that pops up in your mind?

   d) How do you feel about Red Bull and V Energy? (only if participant is aware of these brands)

7. Many young people consume energy drinks. What are your views about them? What would you see as the advantages/good points and disadvantages/not so good points about them?

   (Prompt: Have you ever had energy drinks before? What prompt you to drink these drinks? When did you first try energy drinks? In the survey you mentioned that you drink energy drinks, how often? Do friends/ families drink energy drinks? In what occasions? Have you ever mixed alcohol with energy drinks?)

Appendix R: Flyer for participants recruitment for the online survey



Appendix S: Online survey

Online Survey (URL: https://goo.gl/VAs4h4)

Survey opening Page

Hello,

Thanks for doing this online survey. The purpose of this survey is to find out what you think of a few energy drink brands and the ways they are marketed. It doesn't matter whether you drink them or not. To participate in this survey, **you need to be 18 to 24 years old**.

This survey should take around 10 to 15 minutes to complete. For participating, you will go into a draw to win four $50 iTunes and Rebel Sport vouchers.

This survey is being undertaken by the University of Wollongong (UOW). Your answers will be used for research purposes and will be confidential and anonymous. Findings from this study will be published in a PhD thesis and in a report which will be submitted to a peer-reviewed journal article. Participation in this survey is voluntary and you can stop at any time. Refusal to participate in the study will not affect your relationship with the researchers or UOW. If you have any questions about this survey, please feel free to contact the student researcher on (02) 4221 5643 or limin@uow.edu.au.

This survey is approved by the UOW Human Research Committee (HE 16-038). If you have any concerns or complaints regarding the way this survey has been conducted, you can contact UOW Ethics Officer on (02) 4221 3386 or rso-ethics@uow.edu.au.

By continuing to the next page, you agree to do this survey.

Section A: Demographic details

***A1**

Please select your gender:

☐ Male

☐ Female

***A2**

Please write down your age

***A3**

What is the postcode of your *usual* home/residential address (not where you stay during academic session)?

***A4**

What ethnic group do you belong to?

☐ Aboriginal or Torres Strait Islander

☐ Australian, born in Australia but not Aboriginal or Torres Strait Islander

☐ Chinese

☐ Greek

☐ Italian

☐ Other, please specify:

***A5**

Are you a student?

☐ Yes **[GO A6]**

☐ No **[GO A8]**

***A6**

Are you currently studying?

☐ High school or equivalent

☐ Certificate/diploma (e.g. TAFE)

☐ Foundation Studies (e.g. University of Wollongong College)

☐ Undergraduate university degree (Bachelor's degree)

☐ Postgraduate qualification

☐ Other, please specify:

A7

What is your academic field of study? Eg. Commerce, Arts, IT

***A8**

Do you work (including any part-time or casual works)?

☐ Yes, full-time **[GO A9]**

☐ Yes, part-time **[GO A9]**

☐ No **[GO SECTION B]**

A9
What type(s) of work do you do?
☐Waiter/waitress
☐Cashier
☐ Teacher
☐ Administrative staff
☐ Other, please specify:

Section B: Digital media usage
***B1**
How often do you use the Internet?
☐ Several times a day
☐ Once a day
☐ Several times a week
☐ Once a week
☐ Once a month or less

Section C: Energy drinks marketing

***C1**

Thinking about the marketing of *energy drinks in general*, how often, if at all, do you see:

	Often	Sometimes	Very occasional	Not at all	Don't know
Advertisements on the Internet eg. websites, emails, social media sites like Facebook, YouTube	☐	☐	☐	☐	☐
Advertisements in online games (including before or in-between game , logos or products embedded in the game)	☐	☐	☐	☐	☐
SMS about energy drinks	☐	☐	☐	☐	☐
Energy drinks products shown on broadcast media like television, radio, movie, including advertisements or energy drinks products shown in TV show or movie	☐	☐	☐	☐	☐
Advertisements in printed media (i.e. newspaper, magazine)	☐	☐	☐	☐	☐
Advertisements/promotions in-store (i.e. Coles, Woolworth, service stations) or outdoor (i.e. billboard, at bus-stop/train station/service stations)	☐	☐	☐	☐	☐
Sponsorship of sports team and promotions at events (sports/music) or university O-week	☐	☐	☐	☐	☐
Celebrities/athletes endorse a specific energy drink brands eg. wearing t-shirt/hat with brand name or logo on it	☐	☐	☐	☐	☐

***C2**

Thinking about *energy drink*s *in general*, have you ever:

	Yes	No
Received free samples of energy drinks	☐	☐
Entered a lucky draw organized by any energy drink brand to win prizes	☐	☐
Played a game that contained an energy drink product or energy drink brand logo or name including advertisements before or in-between the game	☐	☐
Browsed an energy drink branded website	☐	☐
Clicked on energy drink related information on social media sites such as Facebook, Instagram and Twitter (exclude health related information)	☐	☐
Watched energy drinks related videos on YouTube (exclude health related video)	☐	☐
Owned clothing such as t-shirts or hats that had an energy drink brand logo or name on it	☐	☐

Section D: Perception of energy drink brands and products

***D1**

Regardless of whether you drink energy drinks or not, we want to find out your views about a few energy drink brands. Even if you've never tried a brand, please try to select an answer that best describes what you think of each brand based on what they look like.

Looks like a drink it might give people a 'boost' for energy and helps people to concentrate on sports/game playing/study/party/long drive						
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
 Red Bull	☐	☐	☐	☐	☐	☐
 Monster	☐	☐	☐	☐	☐	☐
 V	☐	☐	☐	☐	☐	☐
 Pink	☐	☐	☐	☐	☐	☐
 Pepsi Max Kick	☐	☐	☐	☐	☐	☐

Just another soft drink						
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
 Red Bull	☐	☐	☐	☐	☐	☐
 Monster	☐	☐	☐	☐	☐	☐
 V	☐	☐	☐	☐	☐	☐
 Pink	☐	☐	☐	☐	☐	☐
 Pepsi Max Kick	☐	☐	☐	☐	☐	☐

Looks like a drink I would drink (or try) if being offered by friends						
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Don't know
 Red Bull	☐	☐	☐	☐	☐	☐
 Monster	☐	☐	☐	☐	☐	☐
 V	☐	☐	☐	☐	☐	☐
 Pink	☐	☐	☐	☐	☐	☐
 Pepsi Max Kick	☐	☐	☐	☐	☐	☐

*** D2**

This question is about *energy drinks in general*, not a particular brand. Can you please look at the statements below and select an answer that best describes what you think of each statement?

Items	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	N/A
Drinking energy drinks improve performance mentally or physically	☐	☐	☐	☐	☐	☐
Drinking energy drinks improve your social skills	☐	☐	☐	☐	☐	☐
Drinking energy drinks make you more masculine	☐	☐	☐	☐	☐	☐
Energy drink brands are good because they sponsor a lot of sports, music events and charities	☐	☐	☐	☐	☐	☐
Energy drinks are expensive	☐	☐	☐	☐	☐	☐
Energy drinks are easy to access	☐	☐	☐	☐	☐	☐
Energy drinks are harmful for your health	☐	☐	☐	☐	☐	☐
Energy drinks are no different from sports drinks or soft drinks	☐	☐	☐	☐	☐	☐
Energy drinks are commonly drunk by students	☐	☐	☐	☐	☐	☐
Even if under pressure from my friends, I am confident to refuse to drink energy drinks/energy drinks mixed with alcohol when we go out (partying/clubbing)	☐	☐	☐	☐	☐	☐
It is my decision to drink (or not drink) energy drinks to help me focus on study/long shift work/game playing	☐	☐	☐	☐	☐	☐

Section E: Consumption of energy drinks

***E1**

How often do you usually consume energy drinks, including alcohol mixed with energy drinks eg. *Jägerbomb*?

☐ Several times a day
☐ Once a day
☐ Several times a week
☐ Once a week
☐ Once a month
☐Never **[GO SECTION F]**

***E2**

How much energy drink would you usually consume (approximately) on one occasion?

☐ Less than 1 standard can
☐ 1 standard can (approximately 250ml)
☐2 standard cans or 1 large can (approximately 500ml)
☐ More than 1 large can or more than 2 standard cans
☐ Not sure

Section F: Interpersonal influences on energy drinks consumption

***F1**

As far as you know, how many of the people closest to you (i.e. your parents, siblings, close friends, partner) drink energy drinks at least a few times a year?

☐ All of them
☐ Most of them
☐ About half of them
☐ A few of them
☐ Not sure
☐ N/A

***F2**

Regardless of whether you drink energy drinks or not, do you think the people closest to you (i.e. your parents, siblings, close friends, partner) think it is ok or not ok for you to drink energy drinks?

☐ Ok
☐ Not ok
☐ Not sure
☐ N/A

Thank you for completing the survey.

Please enter your contact details to go into a lucky draw of four $50 iTunes and Rebel Sports vouchers.

*****Enter your contact number

OR

Enter your email address

If you have any questions about this survey, please feel free to contact the student researcher on (02) 4221 5643 or limin@uow.edu.au.

If you have any concerns or complaints regarding the way this survey has been conducted, you can contact UOW Ethics Officer on (02) 4221 3386 or rso-ethics@uow.edu.au.

Appendix T: Ethics approval of the exposure experiment study

UNIVERSITY OF WOLLONGONG
AUSTRALIA

APPROVAL LETTER
In reply please quote: HE15/280

10 July 2015

Ms Limin Buchanan

Dear Ms Buchanan,

Thank you for your response dated 6 July 2015 to the HREC review of the application detailed below. I am pleased to advise that the application has been approved.

Ethics Number:	HE15/280
Project Title:	Digital Marketing and its influences on young people: energy drinks as a case study
Researchers:	Ms Limin Buchanan, Prof Heather Yeatman, Dr Bridget Kelly
Documents Approved:	Initial Ethics Application
	Response dated 6/7/15
	Participant Information Sheet V2 5/7/15
	Appendix A – Pre-test Survey V1 28/6/15
	Appendix B – Post-test Semi-structured interview V1 28/6/15
	Appendix C – Links to websites, Facebook pages and online games
	Appendix D – Energy Drinks Fact Sheet
	Appendix E – Email Invitation and Email Communications with local youth service and soccer club V1 28/6/15
	Appendix F – Flyer V1 28/6/15
	Appendix H – Consent Form
	Appendix I - Poster
Approval Date:	9 July 2015
Expiry Date:	8 July 2016

The University of Wollongong/Illawarra Shoalhaven Local Health District Social Sciences HREC is constituted and functions in accordance with the NHMRC *National Statement on Ethical*

Ethics Unit, Research Services Office
University of Wollongong NSW 2522 Australia
Telephone (02) 4221 3386 Facsimile (02) 4221 4338
Email: rso-ethics@uow.edu.au Web: www.uow.edu.au

Appendix U: Ethics approval of the online survey study

UNIVERSITY OF WOLLONGONG
AUSTRALIA

APPROVAL LETTER
In reply please quote: HE16/038
Further Information Phone: 4221 3386

25 February 2016

Ms Limin Buchanan

Dear Ms Buchanan

Thank you for your response dated 22 February 2016 to the HREC review of the application detailed below. I am pleased to advise that the application has been approved.

Ethics Number:	HE16/038
Project Title:	Digital marketing and its influences on young people: energy drinks as a case study - Survey
Researchers:	Ms Limin Buchanan, Professor Heather Yeatman, Dr Bridget Kelly
Documents Approved:	Initial Application
	Response dated 22/2/16
	Online Survey V2 – 15/2/16
	Letter Seeking Permission to Conduct Participant Recruitment V1 – 3/2/16
	Letter of Support from Director, Student Support & Education Analytics, UOW V1 – 22/2/16
	Email of Support from Jamberoo Action Park V1 – 22/2/16
	Email of Support from Kiama Municipal Council V1 – 22/2/16
	Advertising Flyer V1 – 3/2/16
Approval Date:	23 February 2016
Expiry Date:	22 February 2017

The HREC has reviewed the research proposal for compliance with the *National Statement* and approval of this project is conditional upon your continuing compliance with this document.

Approval by the HREC is for a twelve month period. Further extension will be considered on receipt of a progress report prior to expiry date. Continuing approval requires:

- The submission of a progress report annually and on completion of your project. The progress report template is available at http://www.uow.edu.au/research/ethics/human/index.html. This report must be completed, signed by the researchers and the appropriate Head of Unit, and returned to the Research Services Office prior to the expiry date.

Ethics Unit, Research Services Office
University of Wollongong NSW 2522 Australia
Telephone (02) 4221 3386 Facsimile (02) 4221 4338
Email: rso-ethics@uow.edu.au Web: www.uow.edu.au

Appendix V: Participant Information Sheet of the exposure experiment study

UNIVERSITY OF WOLLONGONG

PARTICIPANT INFORMATION SHEET

TITLE: Exploring the impact of food-related Internet sites on young adults

PURPOSE OF THIS RESEARCH

This is an invitation to participate in a study conducted by researchers at the University of Wollongong. The purpose of this research is to explore food-related internet sites. This research is being undertaken as a PhD student project and the result may be published in a peer-reviewed journal.

INVESTIGATORS

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Ms Limin Buchanan
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Faculty of Social Sciences,
School of Health & Society
(02) 4221 5643
limin@uow.edu.au

METHODS AND DEMANDS ON PARTICIPANTS

This study examines Internet use by young people. You would be involved in looking at websites, social media sites and playing an online game. Before you start on the Internet a short survey will be completed, and after the Internet a short interview will be conducted. Overall it should take approximately 30 minutes - the survey, approximately 5 minutes, time on the Internet, approximately 8 minutes and the interview, approximately 10 minutes. This study will be conducted in a computer room in the University of Wollongong or at Sports Club/Youth Centre at your convenience.

The survey will include questions about your Internet usage and your perceptions about a few food and beverage items. During the experiment, you will be asked to browse a few food and beverage website, social media site and play an online game. The semi-structured interview will include questions such as:

- Your perception of the website, social media site and online game included in the experiment
- Your perception about the food and beverage items featured in those sites

The interview will be digitally recorded to allow us to accurate record your responses to the questions.

POSSIBLE RISKS, INCONVENIENCECS AND DISCOMFORT

Other than your 30 minutes participation time in this study, you may be exposed to promotions of some healthy and unhealthy food and drink products. An information sheet about the health benefits/health problems that may arise from consuming the food and drink products will be provided to you at the end of the study.

Your involvement in the study is voluntary and you may withdraw your participation from the study at any time and withdraw any data that you have provided to that point. Refusal to participant in the study will not affect your relationship with the University of Wollongong.

FUNDING AND BENEFITS OF THE RESEARCH

This research will contribute to an understanding of the influences of food-related Internet sites on young adults. Findings from this study will be published in a PhD thesis and in a report which will be submitted to a peer-reviewed journal article. Your confidentiality is assured as information you provide will be assigned as an alphanumerical code and be de-identified after study outcomes are reported back to the participants.

ETHICS REVIEW AND COMPLAINTS

This study has been reviewed by the Human Research Ethics Committee (Social Sciences) (HE-15/280) of the University of Wollongong. If you have any concerns or complaints regarding the way this research has been conducted, you can contact the UoW Ethics Officer on (02) 4221 3386 or email rso-ethics@uow.edu.au

Thank you for your interest in this study.